EXPERIMENT MANUAL

CREATIVE COSMETICS LAB

THAMES & KOSMOS

Please observe the safety information below, the advice for supervising adults on page 1, the safety rules on page 3, and the information about hazardous substances (chemicals) and their environmentally sound disposal, the first aid information, and the other safety information on the inside front cover.

WARNING. Not suitable for children under 8 years. For use under adult supervision. Read the instructions before use, follow them and keep them for reference. Keep the kit out of reach of children under 8 years old. Contains glass that may break. Contains some chemicals which present a hazard to health. Do not allow chemicals to come into contact with any part of the body, particularly the mouth and eyes (except as instructed in the manual). Keep small children and animals away from experiments.

WARNING — This set contains chemicals that may be harmful if misused. Read cautions on individual containers and in manual carefully. Not to be used by children except under adult supervision.

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Warning!

- Parts in this kit have functional sharp points, corners, or edges. There is a risk of injury.
- Always store this experiment kit in a cool place that is inaccessible for small children. Always close containers tightly and keep them away from sources of ignition or open flames (e.g. candles). Do not smoke.
- This kit contains cosmetic products that require careful handling. Therefore, read the instructions before beginning, follow them, and have them ready for reference.
- Always test the cosmetics on a small area of skin first. Discontinue use if irritation or allergic reaction occurs.
- The cosmetic products should only be used as recommended and under the supervision of an adult.
- Make only those products described in the instructions and mix only the recommended substances.
- Do not use any products or substances to which you have known allergic reactions. Check the chemical compositions of the products (inside back cover) for known allergies. Discontinue use and see a doctor immediately in the case of an allergic reaction.
- The finished cosmetics and those made by you according to the instructions are only suitable for external use.
- The cosmetics are not suitable for consumption.
- Do not bring the cosmetics in contact with the eyes or other mucous membranes except as specifically recommended and according to their intended use.

The right to technical changes is reserved. Before beginning, please refer to the list of contents and make sure that all parts are included. Keep packaging and instructions as they contain important information.

First Aid Information

- In case of eye contact: Wash out eye with plenty of water, holding eye open if necessary. Rinse from the nose outwards. Seek immediate medical advice.
- If swallowed: Wash out mouth with water, drink some fresh water. Do not induce vomiting. Seek immediate medical advice.
- In case of inhalation: Remove person to fresh air. For example, move person into another room with open windows or outside.
- In case of skin contact and burns: Wash affected area with plenty of water for at least 10 minutes. Cover burns with a bandage. Never apply oil, powder, or flour to the wound. Do not lance blisters. For lager burns, seek immediate medical help.
- In case of doubt, seek medical advice without delay. Take the chemical and its container with you.
- In case of injury always seek medical advice.
- In case of cuts: Do not touch or rinse with water. Do not apply any ointments, powders or the like. Dress the wound with a germ-free, dry first-aid bandage. Foreign objects such as glass splinters should only be removed from the wound by a doctor. Seek medical advice if you feel a sharp or throbbing pain.

Poison Control Centers (United States)

In case of emergency, your nearest poison control center can be reached everywhere in the United States by dialing the number:

1-800-222-1222

Local Hospital or Poison Centre (Europe)

Record the telephone number of your local hospital or poison centre here:

Write the number down now so you do not have to search for it in an emergency.

Hazardous substances and mixtures (chemicals)

WARNING

Tartaric acid
Causes serious eye irritation.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
If eye irritation persists:
Get medical attention.

WARNING

"Rainbow" Perfume Oil
May cause an allergic skin reaction. Harmful to aquatic life with long lasting effects.
Wear protective gloves. – Avoid release to the environment. – Avoid breathing vapor. – IF ON SKIN: Wash with plenty of soap and water. – If skin irritation or rash occurs: Get medical attention.

Glycerin Soap
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Keep out of the reach of children.
If swallowed, seek medical advice immediately and show this container or label.

Contents of "RAINBOW" Perfume Oil

	Amount [%]
Dipropylene glycol	90-100
Perfume (fragrance):	
Methyl dihydrojasmonate [Methyl (3-oxo-2-pentylcyclopentyl) acetate]	1-10
Tetrahydrolinalool [3,7-Dimethyloctan-3-ol]	1-10
1-(1,2,3,4,5,6,7,8-Octahydro-2,3,8,8-tetramethyl-2-naphtyl)-ethanone (isomers)	1-10
Cyclopentadecanolide [Oxacyclohexadecan-2-one]	0.1-1
3-Methyl-5-phenylpentanol	0.1-1
4(or3)-(4-methyl-3pentenyl0-3-cyclohexenylmethyl acetates & isomers	0.1-1
5-(2,2,3-Trimethyl-3-cyclopentenyl)-3-methylpentan-2-ol	0.1-1
Oxacycloheptadec-10-en-2-one	0.1-1
Ethyl 6-acetoxyhexanoate	0.1-1
1,3,6,7-Tetramethylbicyclo(4.4.0)-dec-7-en-2-yl formate	0.1-1
Dimethyl benzyl carbinyl acetate [2-Methyl-3-phenylpropan-2-yl acetate]	0.1-1
2-Phenoxyethyl-2methylpropionate	0.1-1
4-(4-Hydroxyphenyl)-2-butanone	0.01-0.1
gamma-Nonalactone [Dihydro-5-pentyl-2(3H)-furanone]	0.01-0.1
10-Undecenal	0.01-0.1
4-Undecanolide [5-Heptyldihydro-2(3H)-furanone]	0.01-0.1
3-(3-Isopropylphenyl)butanal [Methyl-3-(1-methylethyl)benzenepropanal]	0.01-0.1
p-Cresyl acetate [4-Methylphenyl acetate]	0.01-0.1
Ethyl vanillin [3-Ethoxy-4-hydroxybenzaldehyde]	0.01-0.1
Dodecahydro-3a,6,6,9a-tetramethylnaphto (2,1-b)furan	0.01-0.1
3-Methyl-2-(2-pentenyl)cyclopent-2-en-1-one	0.01-0.1
4-Methyl-3-decen-5-ol	0.01-0.1
6,8-Dimethyl-2-nonanol	0.01-0.1
Patchouli oil (Pogostemon cablin)	0.01-0.1
Denatonium benzoate	0.001-0.01

Contents of Glycerin Soap

	Amount [%]
Glycerin (CAS #56-81-5)	25-50
Water (CAS #7732-18-5)	10-25
Sodium Stearate (CAS #822-16-2)	10-25
Propylene Glycol (CAS #57-55-6)	5-10
Sorbitol (CAS #50-70-4)	5-10
Sodium Laurate (CAS #629-25-4)	5-10
Sodium Laureth Sulfate (CAS #68891-38-3)	5-10
Sodium Chloride (CAS #7647-14-5)	1-5
Sodium Lauryl Sulfate (CAS #151-21-3)	1-5
Stearic Acid (CAS #57-11-4)	0.1-0.5
Lauric Acid (CAS #143-07-7)	0.1-0.5
Pentasodium Pentetate (CAS #140-01-2)	<0.1
Tetrasodium Etidronate (CAS #3794-83-0)	<0.1

Contents of Blue Cosmetic Dye

Water, FD&C Blue No. 1 (E133/Brilliant Blue FCF), Potassium sorbate, Sodium benzoate

Contents of Red Cosmetic Dye

Water, FD&C Red No. 40 (E129/Allura Red), Potassium sorbate, Sodium benzoate

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› › › IMPORTANT INFORMATION

Dear Parents and Adults,

This kit gives children the ability to discover the world of cosmetics through scientific experiments. With this kit, they can make their own cosmetics, and they can customize them according to their own preferences. Through play, they will learn about the biology of skin and hair, the process of making cosmetics, and the chemistry of some beauty-product ingredients.

The cosmetics that you make yourself in the experiments will have a limited shelf life, and should be used shortly after they are made. Watery substances, like the extracts from herbs, pose the danger of fermentation or growing mold. Storing them in the refrigerator will extend their shelf life somewhat. Please make sure the cosmetics and foods are not confused, and that decayed or fermented products will not be used again.

The cosmetic products should not be used directly in proximity of the eyes. If by mistake something should get into the eye, it should be flushed thoroughly with water.

The materials used are of the highest quality. In spite of this, as with all cosmetic products, incompatibilities or allergic reactions cannot be totally excluded. This is especially true when natural materials are used. We recommend applying small quantities of the individual products to the forearm at the elbow for 30 to 60 minutes. If the skin reacts with reddishness, itching, or flakiness, these products should not be used further. The same is true for all other additives suggested in the instructions. On the inside back cover, you will find a detailed list of all substances contained in the perfume oil and glycerin soap in this kit. You should check this for known allergic reactions.

A. This chemical toy is not suitable for children under 8 years. For use under adult supervision. Keep this chemical toy set out of reach of children under 8 years old.

B. Read and follow these instructions, the safety rules and the first aid information and keep them for reference.

C. Incorrect use of chemicals can cause injury and damage to health. Only carry out those activities which are listed in the instructions.

D. Because children's abilities vary so much, even within age groups, supervising adults should exercise discretion as to which activities are suitable and safe for them. The instructions enable supervisors to assess any activity to establish its suitability for a particular child.

E. The supervising adult should discuss the warnings, safety information and the possible hazards with the child or children before commencing the activities. Particular attention should be paid to the safe handling of alkalies, acids and flammable liquids.

F. The area surrounding the activity should be kept clear of any obstructions and away from the storage of food. It should be well lit and ventilated and close to a water supply. A solid table with a heat resistant top should be provided.

G. The working area should be cleaned immediately after carrying out the activity.

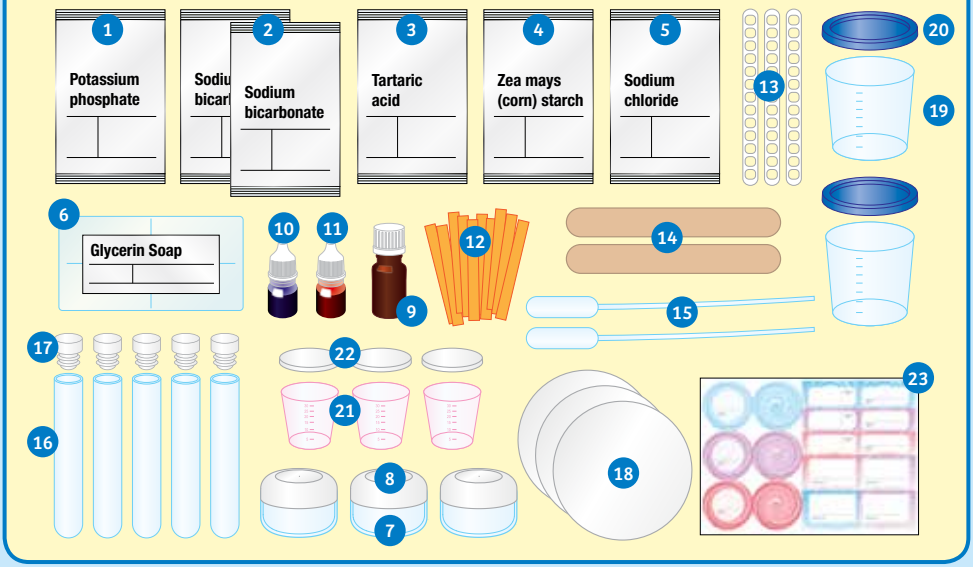
Emphasize to your child the importance of following all instructions and warnings, and the importance of carrying out only those experiments that are described in this manual. Inform your child, but do not frighten him or her — there's no need for that.

646518-02-030517

GOOD TO KNOW! If you are missing any parts, please contact Thames & Kosmos customer service.

US: techsupport@thamesandkosmos.com
UK: techsupport@thamesandkosmos.co.uk

What's inside your experiment kit:



Checklist: Find – Inspect – Check off

✔	No.	Description	Qty.	Item No.
◯	1	Potassium phosphate (Potassium dihydrogen phosphate), 30 g	1	775 237
◯	2	Sodium bicarbonate (Sodium hydrogen carbonate), 30 g	2	775 236
◯	3	Tartaric acid, 30 g	1	775 238
◯	4	Zea mays (corn) starch, 100 g	1	774 801
◯	5	Sodium chloride (Salt), 50 g	1	775 255
◯	6	Glycerin soap, 200 g	1	719 293
◯	7	Cream jar	3	719 288
◯	8	Cream jar lid	3	719 289
◯	9	Perfume oil, 10 ml	1	775 250
◯	10	Blue cosmetic dye, 10 ml	1	719 511
◯	11	Red cosmetic dye, 10 ml	1	719 483
◯	12	pH test strip	10	773 220
◯	13	Plastic stirring rod	3	705 727
◯	14	Wooden spatula	2	000 239
◯	15	Pipette	2	232 134

✔	No.	Description	Qty.	Item No.
◯	16	Test tube	5	705 813
◯	17	Test tube stopper	5	705 814
◯	18	Filter paper sheet	3	702 842
◯	19	Large beaker, 125 ml	2	087 077
◯	20	Lid for 125-ml beaker	2	087 087
◯	21	Small beaker, 30 ml	3	065 099
◯	22	Lid for 30 ml beaker	3	061 160
◯	23	Sticker sheet	1	719 283
◯	24	Plastic experiment station and molds (not shown)	1	719 282

You will also need: oil (such as olive oil, almond oil, grapeseed oil, safflower oil, jojoba oil, avocado oil, peanut oil, rosehip oil, sesame oil, macadamia nut oil, or sunflower oil), sugar, mild soap, water, cosmetic tissues, mirror, fresh or dried flower or herbs, funnel, two (amber) glass jars, sea salt, epsom salt, liquid dish soap, microwave, microwave-safe glass bowl, two bowls, measuring spoons, oven, baking sheet, aluminium foil, shower gel, gelatin, refrigerator, honey

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Safety Rules

1. Read these instructions before use, follow them and keep them for reference.

2. Keep younger children under the specified age limit and animals away from the activity area.

3. Store chemical toys out of reach of young children.

4. Wash hands after carrying out activities.

5. Clean all equipment after use.

6. Do not use any equipment which has not been supplied with the set or recommended in the instructions for use.

7. Do not eat, drink or smoke in the activity area.

8. Make sure that all containers are fully closed and properly stored after use.

9. Ensure that all empty containers are disposed of properly.

10. Do not allow chemicals to come into contact with the eyes or mouth.

11. Do not replace foodstuffs in original container. Dispose of immediately.

12. Test all cosmetics that you make with this kit first on the inside of your forearm and allow 24 hours to pass before applying them to the rest of your body. This way, you can find out if you will have an allergic reaction to one of the components before you apply it to the rest of your body or face.

13. You should label all the containers of your custom cosmetics with the date, contents, and name. Special self-adhesive labels are provided for you to write on and attach.

EXPERIMENT 1

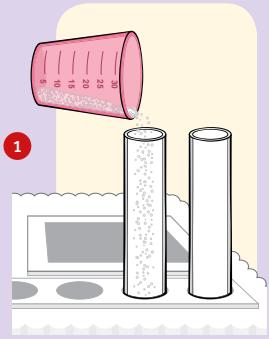
Make a salt scrub

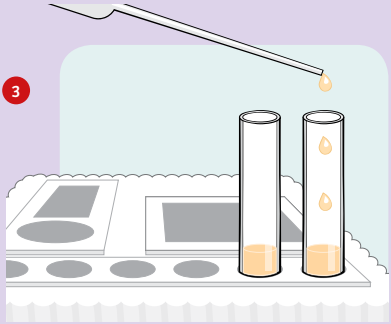
YOU WILL NEED

Small beaker, two test tubes, experiment station, pipette, stirring rod, perfume oil, salt, *oil (see list of oils on page 2), sugar*

HERE'S HOW

1. Place the two test tubes in the experiment station. Use the small beaker to measure 7 ml of salt and pour it into one of the test tubes. Then measure and pour 7 ml of sugar into the second test tube.
2. Measure 7 ml of oil with the small beaker. Add 3 drops of the perfume oil to the beaker.
3. Divide the oil evenly between the two test tubes (3.5 ml each) using the pipette. Use the stirring rod to stir the contents.
4. Rub a small amount of the salt scrub on a small area of skin on your arm. Then rub a small amount of the sugar scrub on the area next to the area where you used the salt scrub. Compare the smoothness of your skin in both areas.





Do not use the salt or sugar scrub on dry skin. You do not need to scrub hard or long for your skin to become smooth. You may see some initial redness after using the salt or sugar scrub.

WHAT'S HAPPENING?

Table salt and sugar both consist of crystals. As you scrub your skin, the sharp microscopic edges of the crystals work like sandpaper, removing the dead skin cells on the outermost layer of your skin. This process is called **exfoliation**.

CHECK IT OUT

The Skin: Our Largest Organ

SUPER THIN PROTECTIVE ARMOR

The visible surface of the skin, the epidermis (A), is the protective layer, shielding against the effects of the environment. Even though it is only about 4/1000 of an inch (~0.1 millimeter) thick, it lets neither water nor poison through, and, as thin as it is, it is further subdivided into three layers.

Right at the surface is a rough outer layer called the stratum corneum. It consists of dead or dying cells that adhere together. Dead cells are constantly being rejected by the body and are continuously replaced by new cells. The new cells come from the layers underneath. The deepest layer of the epidermis is called the stratum germinativum. Here, skin cells are constantly dividing and pushing older cells toward the surface. All cells in the skin surface are replaced about every 28 days, as fresh cells are pushing out and the outermost skin particles flake off.

SURPRISING FACTS ABOUT THE SKIN

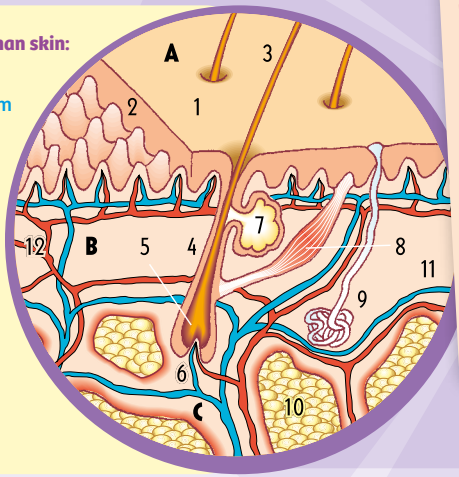
The skin of an adult person covers an area of about 16 to 22 square feet (1.5 to 2 square meters). It weighs about one sixth of the total body weight, which on average for an adult is 22 to 26 lb (10 to 12 kg). That's really heavy! Did you ever think of that?

Although the skin is the largest and heaviest organ, many people don't know all of the things that it does. The skin performs more functions than most other organs: It protects the body against heat, cold, injury, and radiation. The thin layer works as a heating and ventilation system assuring that the body temperature always stays at a comfortable level. At the same time, it forms the first defense against bacteria, viruses, and mold. And last but not least, the skin is one of the most important and diverse sensing organs. No other part of the body has more tactile sensitivity than the skin.

The composition of human skin:

1. Stratum corneum
2. Stratum germinativum
3. Hair
4. Hair follicle
5. Hair root
6. Blood vessels (capillaries)
7. Fat gland (sebaceous gland)
8. Hair follicle muscle (erector muscle)
9. Sweat gland
10. Fat cells

11/12. Blood vessels



THE THREE-LAYER MODEL

As large as the skin is, it is also one of the most delicate organs because it is only approximately 1/8 of an inch thick (a few millimeters). The skin is subdivided into three different layers.

CHECK IT OUT

Light- or Dark-Skinned? What's the Difference?

The color tone of your skin comes from the color substance inside the skin known as melanin. Dark-skinned people simply produce more of it.

The skin's color is created in the deepest layer of the epidermis, the stratum germinativum. Here, specialized skin cells called melanocytes produce a colored substance called melanin. The melanin is distributed to neighboring cells and gives your skin its color. The sun's ultraviolet radiation darkens the melanin, and also causes the melanocytes to produce more melanin.

Whether you are light- or dark-skinned has nothing to do with the number of melanocytes you have, but rather with the amount and composition of the color material produced inside them. Dark-skinned people produce enough color material to color the entire surface layer. In contrast, light-skinned people produce only enough to color a few cell layers. This natural phenomenon has an important background: Like a natural "sunscreen," the pigmentation in the cells captures the dangerous UV radiation that skin is exposed to every day. The pigmentation shields the underlying, sensitive layers and protects them from damage.

ELASTIC AND STRONG

Under the surface layer, or the epidermis (layer A in the diagram on the previous page), lies the dermis (layer B). It consists of elastic, robust connective tissue — a network of collagen and elastin fibers — and gives the skin its strength. The dermis is crisscrossed by many fine blood vessels and lymph vessels that provide the skin with nutrients and carry away waste products, respectively.

Furthermore, in this skin layer there are numerous nerve threads and sensing organs with which you can receive the very different feelings of cold, heat, pressure, or pain. In between these nerves, there are crowded sweat and fat glands that are important for heat regulation and the formation of the protective water-fat film of the surface layer.

Fat glands occur only in connection with hair. They serve to grease the hairs and the skin and thereby keep them elastic and flexible.

The thickness of the skin is not uniform. At highly-loaded places, such as the soles of your feet, the surface layer can be up to 3/16 inch (~5 millimeters) thick. At other locations, it is so thin that the light reflected from the blood in the blood vessels can give the skin a rose color, which is especially clearly seen on the lips.

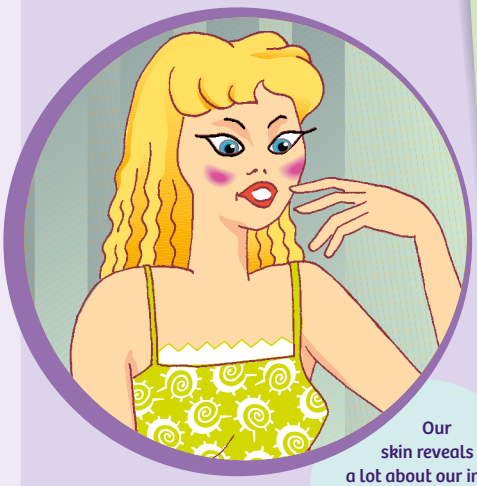
CHECK IT OUT

Your Telltale Skin

The skin is a real tattletale. It just cannot keep a secret. Every emotional condition shows up clearly. You may blush when you feel embarrassed, or get red spots from excitement. You may become pale from a scare, and if you are afraid or something is distressing to you, you may have cold sweats.

Also, stress, poor health, or illness leave their revealing traces on the skin. Your doctor can recognize a number of illnesses from the skin's appearance. When the liver or digestive system is not working correctly, a yellowing of the skin may result. An iron shortage makes the skin pale and gray. Chill or vascular disturbances may leave the skin slightly blue.

If, however, you are healthy, your skin will show off its best side, and you will feel visibly well in it.



Our skin reveals a lot about our inner self. For example, the color of our cheeks can indicate our mood.

On about 1/6 of a square inch (one square centimeter) of human skin, you will find:

- 200 pain receptors
- 100 pressure receptors
- 12 cold receptors
- 2 heat receptors
- 100 sweat glands
- 40 fat glands

FAT AND WATER STORAGE

The third skin layer (layer C in the diagram on page 5), stores fat and water, and, due to its high content of fat cells, is known as **subcutaneous fat tissue.** It protects against cold, and acts as a buffer against pressure, impacts, and tears from the outside. Together with the dermis, the subcutaneous fat tissue is where the largest amount of water is stored in the human body: Depending on body fat content, up to 20% of the entire water content of the human body is in the skin.

The number of fat cells in the loose connective tissue is determined in early childhood. Anyone who eats too much as a baby will form more fat cells than are really needed. These fat cells will wait an entire lifetime to satisfy themselves completely.

Here's a more reassuring fact: Having a good amount of fat content in the subcutaneous tissue lets the skin look tighter, and thus younger!

EXPERIMENT 2

What type of skin do I have?

YOU WILL NEED

Mild soap, water, cosmetic tissues, good lighting, mirror

HERE'S HOW

1. Wash your face with soap.
2. Check the condition of your skin after about one hour. How does it feel?
3. Press a thin cosmetic tissue onto your face and hold it up to the light. Are there signs of grease spots? If yes, where are they?

Combination skin type: Your skin will feel tight to begin with, but will feel normal later. The cosmetic tissue will show light spots of grease on the forehead and nose.

Dry skin type: Your skin will feel tight even one hour after the washing, and there will be no signs of grease spots on the tissue.

Oily skin type: Your entire face is shiny, and clear grease spots are left all over the tissue.

Sensitive skin type: Your skin is extremely dry, delicate, and feels very sensitive. It is tight, and may show red spots or flakes, but there will be no oil spots on the tissue.

Normal skin type: Normal skin has an even tone, a smooth texture, very few blemishes, and no oily spots or dry areas. The tissue will not show any spots.

Care for Your Skin Type

Knowing your skin type is crucial to proper skin care. Creams and lotions can work only when they correspond to the specific needs of your skin. There is a simple procedure for determining your skin type in the beauty tip above. But once you've determined your skin type, now what? Keep reading on the next page.

The imprint on the tissue will indicate your skin type quickly and reliably.

CHECK IT OUT

THE COMBINATION SKIN TYPE ...

... is the most prevalent skin type. Just because there is a light shine on the forehead, nose, and chin — which is called the T-zone due to its shape — there is no reason to combat it with anti-grease treatments.

If your T-zone has a tendency to become very greasy and also exhibits impurities, especially during puberty, you should use cosmetics prepared especially for greasy skin.

A non-oily moisturizing face wash, special creams or pH-neutral detergents are suitable for cleansing. It is important to rinse with plenty of lukewarm water after washing.

If the T-zone is very greasy, it can be helpful to wipe the affected areas in the morning and evening with cleaning lotions containing some alcohol or special herb extracts.

Creams or lotions should contain a great deal of moisture but not too much oil or grease.

Artificially-made soaps are called **detergents**. These are not like normal soaps made from natural fats. They are made from synthetic deterging agents. Detergents change the pH value of the skin only a little, but they degrease it more than normal soaps.

Dry skin is "thirsty." Help it by getting lots of liquid. Water and herb teas are best suited for providing your skin with enough moisture from inside.

Avocados are real energizers and can offer your skin a lot when applied topically: essential fatty acids that protect your skin from drying out, and vitamins A and B, and pantothenic acid that promotes regeneration of the skin. Avocado oil is a balm for dry sensitive skin.

DRY SKIN ...

... is generally also delicate and sensitive. Pimples or bumps are very uncommon in dry skin, but it does have a tendency toward red spots, is quickly irritated, is flaky, and can feel very tight especially after washing. Dry skin has a greater tendency to develop irritable spots than any other skin type. The reason is that the fat and sweat glands are slow to produce fat and sweat, so that the skin lacks grease and moisture.

For cleansing, an oily cleaning lotion (cleansing milk) that is wiped off with cosmetic tissues or water is very useful. You should avoid soaps, because they will dry out your skin even more.

Important: Face lotions should always be free of alcohol.

Creams and lotions for dry, sensitive skin must contain oil and moisturizer. The emphasis should be on oil content, because a too-high content of water — which unfortunately is often recommended by the cosmetics industry for dry skin — makes the skin porous, causing it to lose even more water through evaporation.

NATURE'S GIFT: "NORMAL" SKIN ...

... If you have normal skin, you should consider yourself lucky. Even though it is called "normal," it is not common. It is a special gift from nature. Perfectly healthy skin has good blood circulation, and is delicate and flexible. The pores are barely visible, the complexion radiates nicely without being greasy, and blemishes are rare. You are lucky if you have all this without any work! But even perfect skin needs proper skin care. Use lukewarm water, and a mild, pH-neutral soap for cleaning, as well as an oil-free cream or lotion to support and pamper it.

By cleansing with small, soft face brushes, surplus grease and dead skin cells that could plug the pores are thoroughly removed.

Aloe vera and calendula oil are ideal for greasy skin, because they treat it without supplying additional grease.

OILY SKIN ...

... is the skin best protected against the effects of the environment and early aging. But that is of small consolation when pimples appear regularly, your complexion is pale with coarse pores, and you struggle with acne.

As with dry skin, the sweat and fat glands are at fault again. But this time, it is because they are working overtime. Unfortunately, they cannot be stopped. The only thing that helps is systematic care. Only this will prevent the pores from becoming plugged by excess production of sweat and oil.

For oily skin, regular cleansing is the most important care — you should be very diligent and go after the grease film in the morning as well as in the evening. Detergents or cleansing lotions that only change the pH-value of the skin by a small amount are best suited. This is because when washing dries your skin, it will react by producing yet more oil.

Alcohol-containing face cleansers for oily skin can be helpful in closing up the pores. Often, they also contain disinfecting agents such as witch hazel or menthol.

Creams or lotions are not needed for oily skin. If used, they should contain lots of moisture and only very little grease. Any type of oil is totally unsuitable.

EXPERIMENT 3

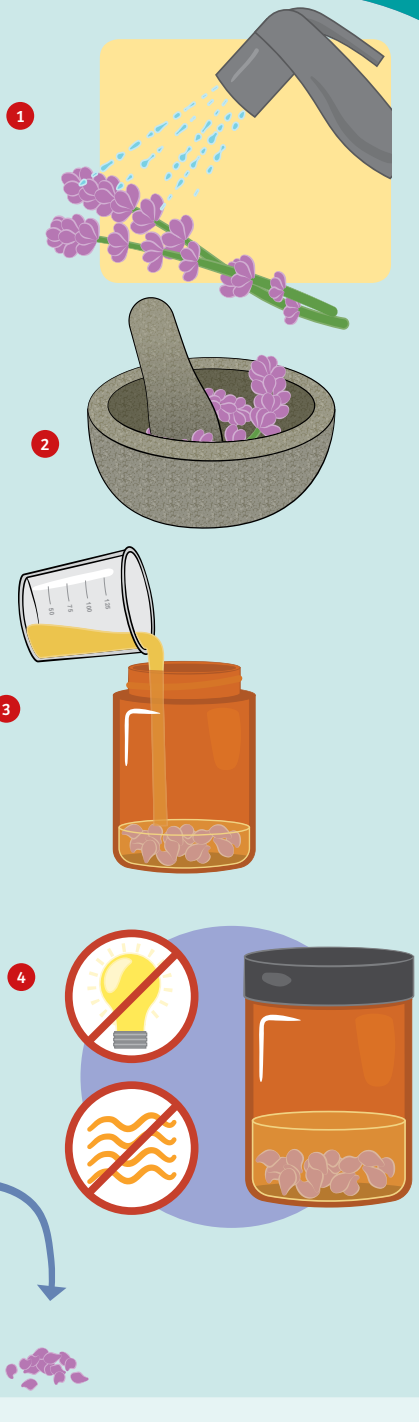
Make scented oils

YOU WILL NEED

Filter paper sheet, *half of a cup (50 ml) of fresh or dried flowers or herbs (such as lavender, rose, mint, rosemary, vanilla, or citrus peels), approximately 100 ml of oil (see page 2), two clean glass jars (amber jars work best), funnel (optional)*

HERE'S HOW

1. If you are using fresh flowers or herbs, wash them first. Then thoroughly dry them. It is important that no moisture is introduced into the oil, as the oil may become rancid or start to grow mold or bacteria.
2. Gently crush or chop the flower petals or herbs into small pieces.
3. Place them into a clean glass container. Add approximately 100 ml of oil. The oil should completely cover the flowers or herbs.
4. Let the jar sit in a cool, dark place for two or three days.
5. Afterward, pour the oil and dried flowers through a filter paper sheet folded into a cone (and set into a funnel if necessary). This will filter out the solid pieces of flowers or herbs. Keep the oil and discard the filtered-out solid pieces.



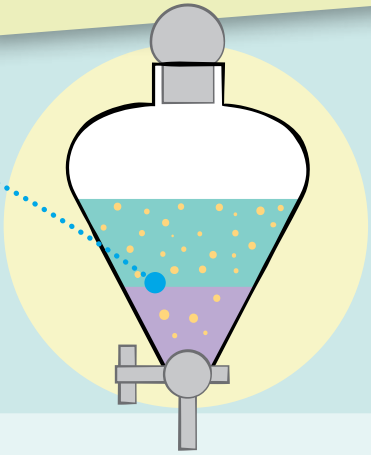
CHECK IT OUT

Aroma Compounds

Where do the fragrances of foods, spices, perfumes, and flowers come from? Their smells come from chemical compounds called **aroma compounds.** Aroma compounds are able to vaporize easily enough that they can be transported through the air to the smell, or olfactory, receptors in your nose. Chemists call the ability of a liquid to vaporize easily **volatility.**

In Experiment 2, you **steeped** the flower or herb pieces in oil to extract these aroma compounds. This is the same as when you place tea leaves in hot water to extract chemical compounds such as caffeine out of the tea leaves.

You might have seen the word **extract** used on cosmetic products, such as "contains green tea extract." Chemist use extraction as a way to move a substance from one liquid to another. The two liquids used are **immiscible,** meaning that they do not mix. Oil and water is an example of two immiscible liquids. The substance that you want to extract travels from the first liquid to the second because it is more **soluble,** meaning it dissolves easier in the second liquid.



EXPERIMENT 4

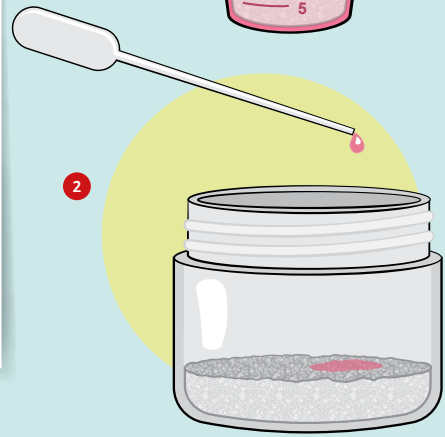
Making a salt bath

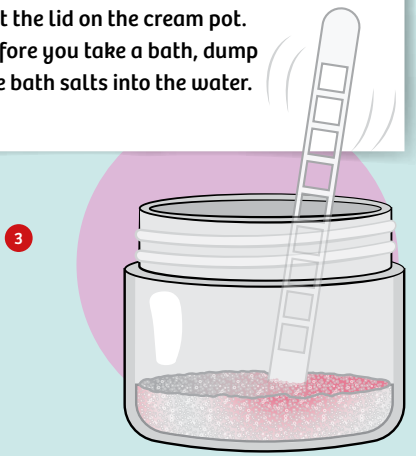
YOU WILL NEED

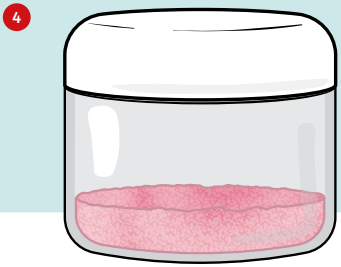
Small beaker, cream pot with lid, blue or red cosmetic dye, stirring rod, perfume oil, salt, *oil (see page 2), other salts (optional)*

HERE'S HOW

1. Measure 30 ml of salt using the small beaker. You can add 30 ml of epsom salt or 30 ml of sea salt as well. See the explanation below.
2. Put the salt into the cream pot. Add 5 drops of perfume oil and 5 drops of blue or red cosmetic dye.
3. Mix thoroughly with the stirring rod.
4. Put the lid on the cream pot. Before you take a bath, dump the bath salts into the water.







WHAT'S HAPPENING?

The salt included in this kit is sodium chloride, which is also known as common table salt. When added to the bath, it dissolves into the water, where it can ease muscles, soften skin, and reduce swelling. Epsom salt is a completely different type of salt (magnesium sulfate), but it has similar properties. Sea salts naturally contain many different minerals that the human body needs. The perfume and dye help make the relaxing salt bath experience even more enjoyable.

EXPERIMENT 5

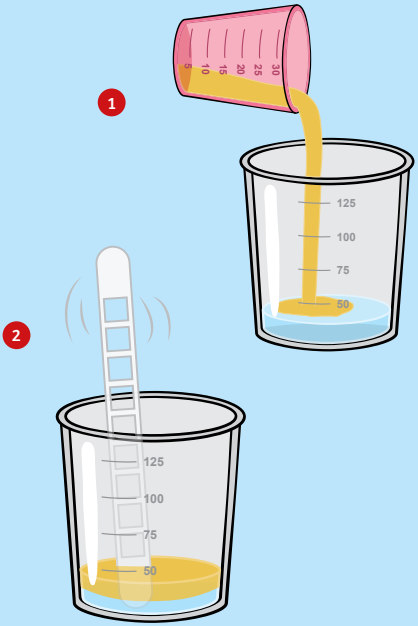
Oil and water

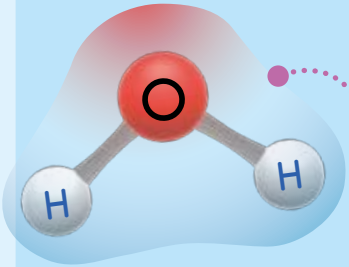
YOU WILL NEED

Large beaker, small beaker, stirring rod, *oil (any type), water*

HERE'S HOW

1. Into the large beaker, pour 20 ml of water. Then pour 20 ml of oil. What do you notice about how the oil and water interact?
2. Stir the contents until the oil and water appear mixed. Let the liquid sit for 30 minutes. Observe what happens to the oil and water.

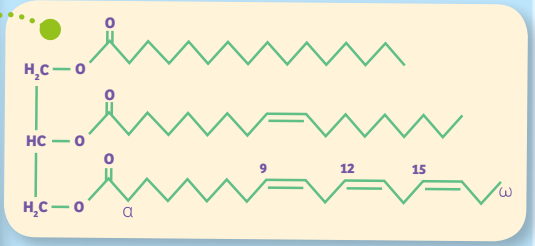




WHAT'S HAPPENING?

An important property of water is that it is a polar molecule. This means that one side of the molecule has a slight positive charge while the other has a slight negative charge. Water is **polar** because the oxygen atom is a much larger atom than the two hydrogens. This has an important influence on the way that water interacts with other molecules.

Unlike water, oils are **nonpolar**. This is because oils have long chains of **carbons and hydrogens**, which don't have different positively and negatively charged ends like water. This difference in polarity between water and oil is the reason that oil and water don't mix! A general rule of thumb is that polar liquids dissolve in polar liquids, and nonpolar liquids dissolve in nonpolar liquids.



Keep the oil and water for the next experiment.

CHECK IT OUT

The hydrophobic effect

The tendency of a nonpolar substance to separate out of a polar substance, which you observed in Experiment 5, is known as the **hydrophobic effect**.

This phenomena is critical for the function of cells, and thus life itself!

HYDROPHOBIC

The word **hydrophobic** comes from the Ancient Greek roots for "water" and "fear." Hydrophobicity is the physical property of a molecule or material to repel water.

From Experiment 5, it may seem that there is a "repulsive force" separating the oil and water. However, it is just the absence of attraction that causes the two liquids to separate.

Understanding how polar and nonpolar molecules interact is also an important part of creating cosmetics. For example, it is important that the oil and water in creams and lotions do not separate when they sit on the shelf.

HYDROPHILIC

The opposite of hydrophobic is **hydrophilic**, which come from Ancient Greek root words for "water" and "loving." A hydrophilic substance is attracted to water and tends to dissolve in water. What would be some examples of hydrophilic substances?

EXPERIMENT 6

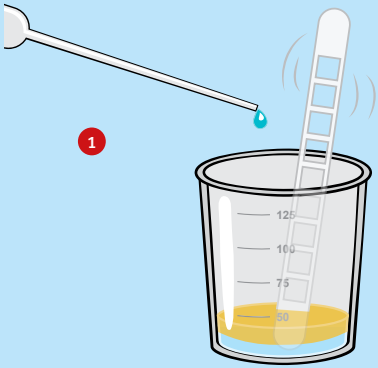
Emulsions

YOU WILL NEED

Large beaker with oil and water from Experiment 5, stirring rod, *dish soap*

HERE'S HOW

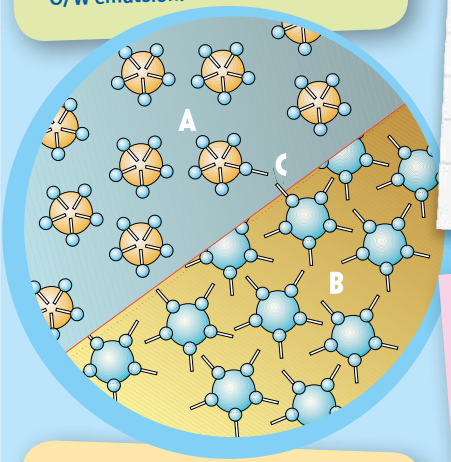
1. Add a few drops of dish soap to the oil and water mixture that you made in the previous experiment. Then mix the liquids again and let it sit for another 30 minutes. Observe what happens.



WHAT'S HAPPENING?

The oil and water are able to stay mixed when you add the dish soap because the dish soap acts as an emulsifier.

In O/W emulsions (A), tiny globules of an oily substance are suspended throughout a watery solution. Ordinary milk is an example of an O/W emulsion.



In W/O emulsions (B) the situation is reversed: Watery components are suspended in an oily substance. An example of this is butter.

Because oil and water normally do not mix, a substance called an **emulsifier** is used to bind the two liquids together and keep them well-mixed. The oil and water mix on a molecular level. In mixtures, the substances are dispersed in each other, but are not chemically united. There are two types of emulsions: **oil-in-water emulsions (O/W)**, and **water-in-oil emulsions (W/O)**.

One class of emulsifiers are called surface active agents or **surfactants**. Surfactants possess hydrophobic (water-fearing) as well as hydrophilic (water-liking) characteristics, which allow them to reduce the surface tension between water and oil. The first surfactant produced artificially was soap. Soap's fat-loving component gives it the ability to dissolve oily dirt particles in water and wash them away.

EXPERIMENT 7

Make molded glycerin soaps

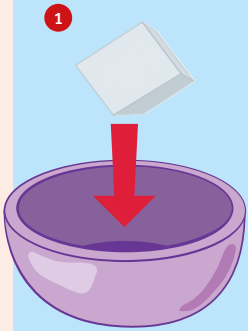
YOU WILL NEED

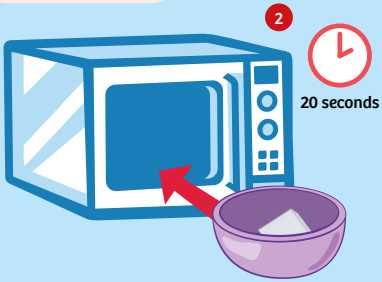
Glycerin soap base, perfume oil, red or blue cosmetic dye, wooden spatula, plastic soap mold, *microwave, glass bowl*

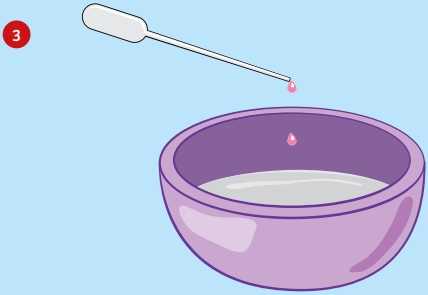
HERE'S HOW

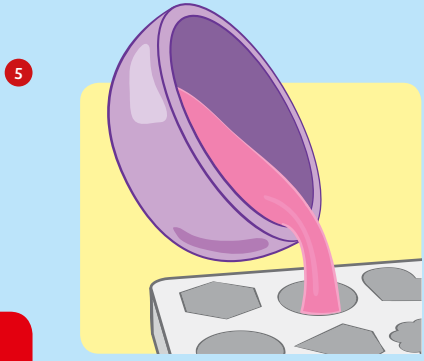
1. Place one piece of glycerin soap in a microwave-safe glass bowl.
2. Heat the glycerin soap in a microwave for approximately 20 seconds or until it is a liquid.
3. Add a few drops of perfume oil (the more you add, the stronger the scent) and red or blue cosmetic dye. Then mix with the wooden spatula. (Optional: Place a small toy inside the soap or add some dried flowers or herbs.)
4. When it is mixed and lukewarm, pour the mixture into the cavities in the soap mold.
5. Wait 1–2 hours for the soap to cool and harden. Then, the molded soaps can be popped out of the mold and used.

Safety Notes: Warning! See the inside front cover for hazardous chemical safety information. Caution! High temperatures. There is a risk of burns. Adult supervision required.







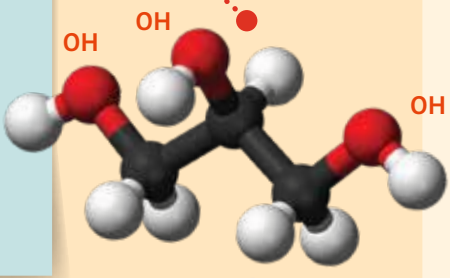


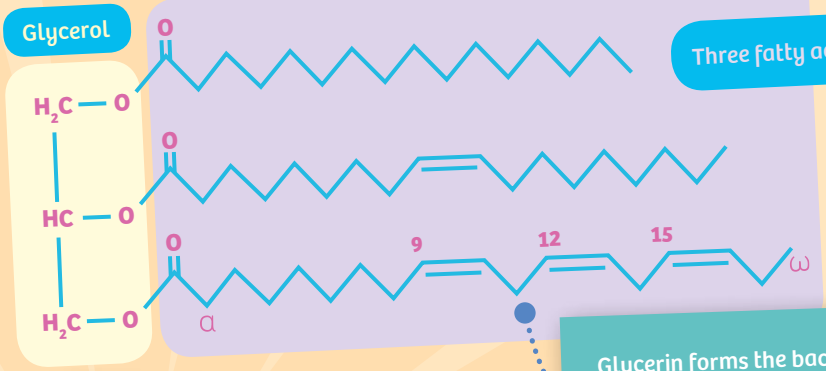
Clean up: You can wash the microwave-safe bowl in the sink with some warm water.

CHECK IT OUT

What Is Glycerin?

Glycerin, also known as **glycerol**, is an organic compound with the chemical formula $C_3H_8O_3$. Glycerin has three hydroxyl groups (OH) which make it a polar molecule. This is why glycerin is soluble in water.





Glycerin forms the backbone of fat molecules or **triglycerides.** Fat molecules are the main component of the oils that you are using. They are also the main component of the fat in animals, including humans!

A triglyceride has one glycerol molecule which connects to three **fatty acid** molecules. A fatty acid molecule is a long chain of carbons (with hydrogens attached) with a **carboxylic acid group** (–COOH).

Stearic Acid

Stearic acid is produced during the soap making process. It is used in the production of detergents, soaps and cosmetics.

CHECK IT OUT

How Is Soap Made?

Triglycerides in vegetable oils and animal fats are used to make soap in a process called **saponification.**

The triglycerides are treated with a strong base, such as sodium hydroxide or potassium hydroxide. The base breaks the bond between the glycerol molecule and the fatty acid molecules. The fatty acid molecules then combine with the base to form soap. The glycerol can be left in the soap, where it acts as a softening agent, or it can be separated out.

HARD SOAP VS. SOFT SOAP

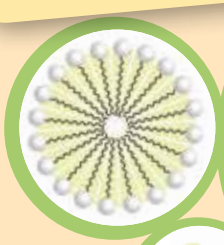
The nature of the base used to make soap, causes the soap to have distinct properties. Soap made with the base sodium hydroxide (NaOH) forms "hard soap," which can be used in **hard water.** Hard water is water that contains higher levers of minerals such as calcium and magnesium. While soap made with the base potassium hydroxide make "soft soaps."

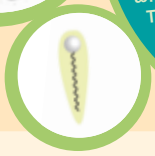
DID YOU KNOW?

Saponification can occur in oil paintings. The pigments in oil paint can contain heavy metals such as lead or zinc. These metals react with the fatty acids in the oil portion of the paint, creating soap!

HOW DOES SOAP WORK?

The carboxyl group (–COOH), or "head," of the fatty acid molecule is polar, making that portion of the molecule hydrophilic. The long carbon and hydrogen "tail" is nonpolar. Soap molecules are able to completely surround oily dirt molecules with their nonpolar tails pointed inward. The polar heads are hydrophilic, so they are attracted to the water molecules all around them, and the whole thing can be washed away.





EXPERIMENT 8

Testing acidity with pH test strips

YOU WILL NEED

Glycerin soap from Experiment 7, pH test strips, *bowl*, *water*

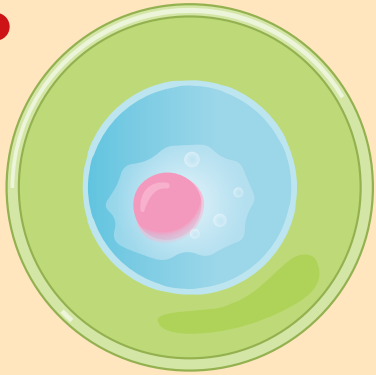
HERE'S HOW

1. Fill the bowl with a small amount of water. Dip one end of a pH strip into the water. Observe the color.
2. Dissolve a small amount of the glycerin soap from Experiment 7 in the water. Dip the end of a second pH strip into the water. Observe the color.
3. Compare the colors of the pH strips to the colors on the scale below to determine the pH value of the two liquids.

Use your pH strips to test the pH of other solutions such as lemon juice, milk, orange juice, and soda.

1

2



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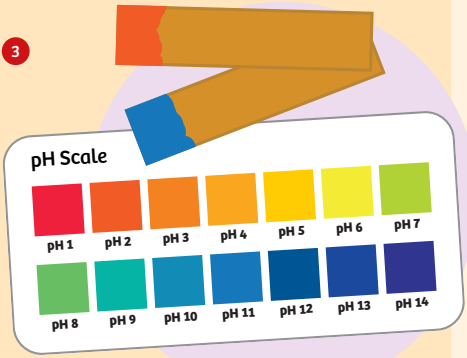
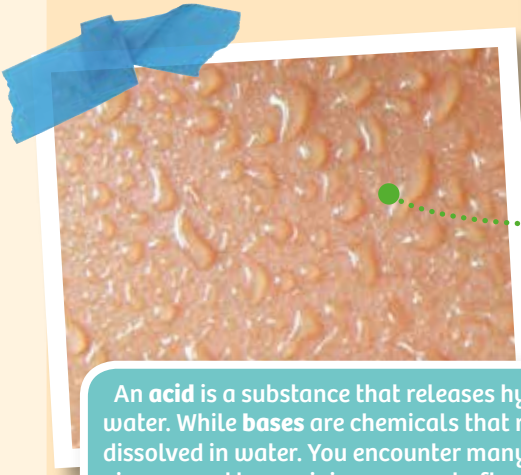


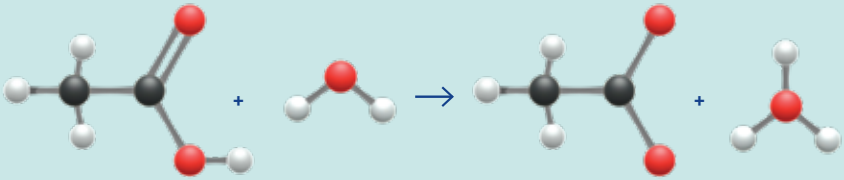
CHECK IT OUT

Acids and Bases



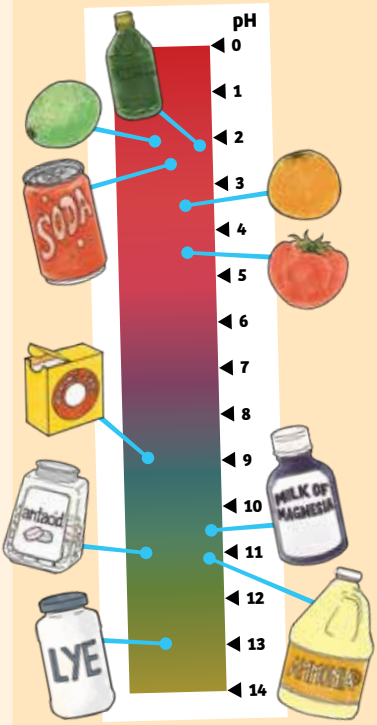
Nature has really taken good care of us. Our numerous fat and sweat glands produce a protective water-fat film that keeps our skin and hair flexible, and works as a water repellent. Because of this film, water simply runs off your skin in the shower instead of sticking to you or being absorbed. This film is called the **acid mantle,** because it is mildly acidic — its pH-value varies from 4 to 6.

An **acid** is a substance that releases hydrogen ions (H^+) when dissolved in water. While **bases** are chemicals that release hydroxide ions (OH^-) when dissolved in water. You encounter many acids and bases every day. The vinegar and lemon juice you use to flavor food, the hydrochloric acid in your stomach used to digest food, and the sulfuric acid in car batteries are all acids. While baking soda, ammonia, and many household detergents are bases.



The acidity of your skin protects you like armor against bacteria, viruses, and mold, which are paralyzed by acidic environments. By washing too frequently and using an unsuitable body cleanser, you can damage this protective acidic coat. This is why it is very important to treat the skin with care and use the right cleansers.

CHECK IT OUT



pH: Chemists use the pH system to measure acidic and basic solutions. pH stands for "potential of hydrogen," and the p is lowercase while the H is capitalized. The pH scale goes from 0 to 14. Values below 7 are acidic and values above 7 are alkaline. Pure water has a pH of 7, which is considered neutral — neither acidic or alkaline.

Healthy skin has a pH-value of 5.5 to 6.5. After washing with regular soap, its pH-value will be elevated to about 9. It can take up to 2 hours before the skin can replace its acidic protective coat. Until then, if the skin is too weak, the doors are wide open for attacks by infectious agents. You can help your skin protect itself by selecting suitable skin care products in the range of pH 5 to 5.5.

Many plants, such as cherries, violets, blueberries, and black currants contain natural dyes that act as indicators.

Why do pH strips change color when they come in contact with an acid or base? pH strips are made from filter paper that has been soaked in different pH **indicators** and allowed to dry. An indicator is a molecule that will change color if it is placed in an acid or a base.

EXPERIMENT 9

Make a bath bomb

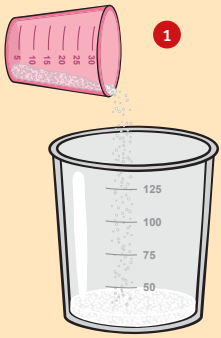
YOU WILL NEED

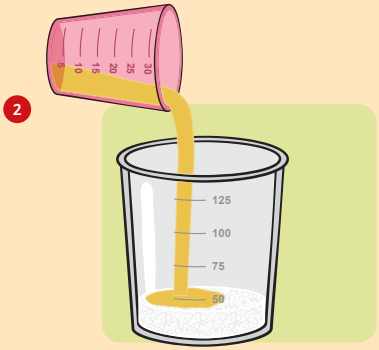
Large beaker, small beaker, sodium hydrogen carbonate, tartaric acid, starch, red or blue cosmetic dye, perfume oil, wooden spatula, bath bomb mold, *oil (see page 2)*

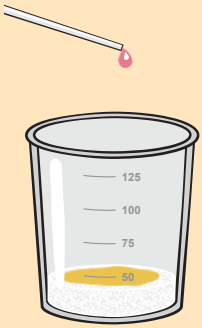
HERE'S HOW

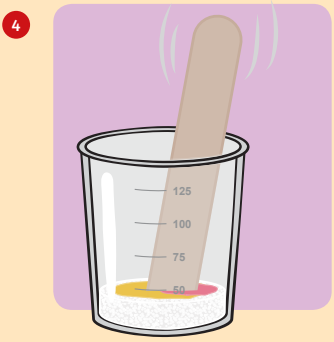
1. Measure 15 ml of sodium hydrogen carbonate with the small beaker. Then pour it into the large beaker.
2. Next measure 7 ml of tartaric acid, 10 ml of starch, and 7 ml of oil with the small beaker, adding each to the large beaker one at a time.
3. Add a few drops each of red or blue cosmetic dye and perfume oil.
4. Mix until it has the consistency of wet sand.
5. You can either mold the mixture into shapes using the mold in the kit, or you can form small balls by rolling the mixture in your hands. Let the shapes or balls dry for two days before use.

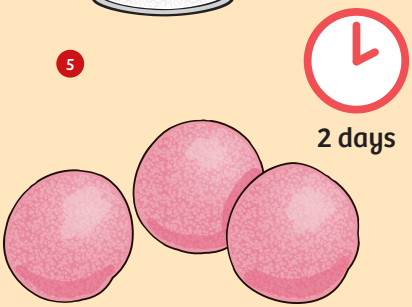
Safety Note: Warning! See the inside front cover for hazardous chemical safety information.











EXPERIMENT 10

A second bath bomb formula

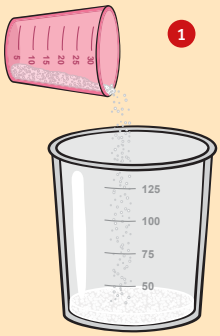
YOU WILL NEED

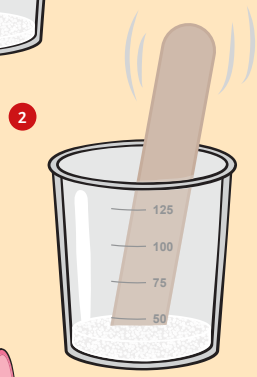
Large beaker, small beaker, sodium hydrogen carbonate, potassium dihydrogen phosphate, pipette, perfume oil, wooden spatula, *water, oven, baking sheet, aluminium foil*

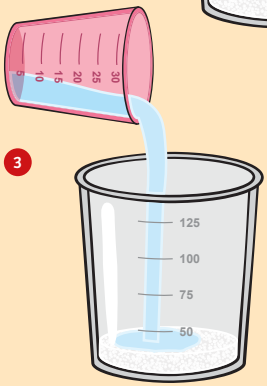
HERE'S HOW

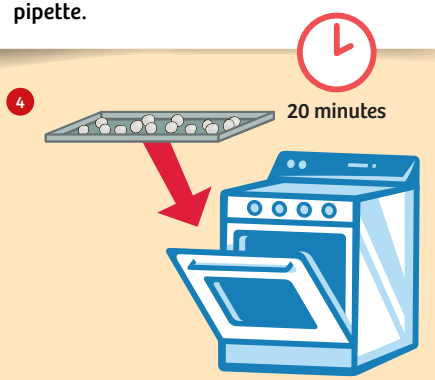
1. Measure 15 ml of sodium hydrogen carbonate with the small beaker. Then pour it into the large beaker.
2. Measure 7 ml of potassium dihydrogen phosphate and pour it into the large beaker. Stir the two powders together.
3. Add 5 ml of water and stir quickly. Form a small ball or mold the mixture in the bath bomb mold.
4. Bake the bath bomb(s) in the oven for 20 minutes at 180 °F on a baking sheet covered with aluminium foil. Then let them cool.
5. When they have cooled, put a few drops of perfume oil on them using the pipette.

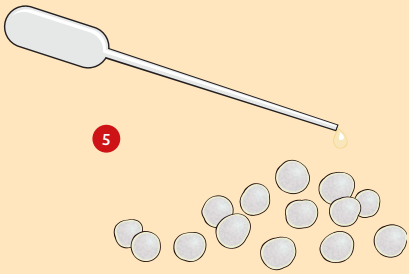
Safety Note: Caution! High temperatures. There is a risk of burns. Adult supervision required.











EXPERIMENT 11

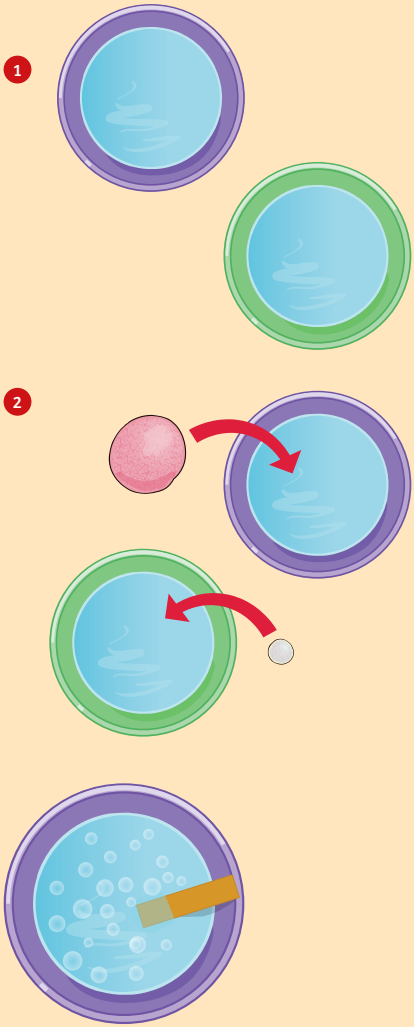
Fizzy bath bomb experiment

YOU WILL NEED

One bath bomb each from Experiments 9 and 10, two pH strips, *two bowls, water*

HERE'S HOW

1. Fill each bowl with enough water to cover a bath bomb.
2. Place a bath bomb in each of the bowls of water at the same time.
3. Compare the amount of bubbling that the two bath bombs produce. Then dip a pH strip into each of the bowls and compare the pH of the solutions.



WHAT'S HAPPENING?

The bubbling of the bath bombs is caused by a **chemical reaction** that is taking place in the bowls. Both bowls exhibit a fizzing reaction. In the first version of the bath bomb, the sodium hydrogen carbonate (also known as sodium bicarbonate), which is a base, is reacting with the tartaric acid. The products of this reaction are carbon dioxide gas (the bubbles), water, and a chemical called sodium tartrate. In the second, the sodium hydrogen carbonate is reacting with the potassium dihydrogen phosphate, which is an acid (like tartaric acid). The products of this reaction are also carbon dioxide and water, but in this case a chemical called hydrogen phosphate.

EXPERIMENT 12

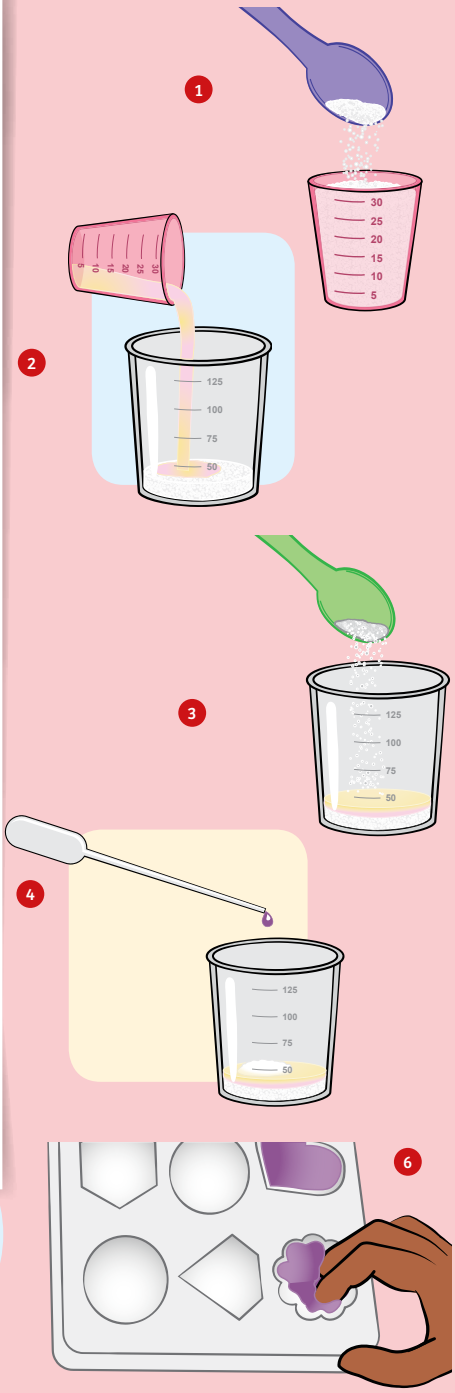
Shower dough

YOU WILL NEED

Starch, salt, small beaker, large beaker, blue or red cosmetic dye, stirring rod, plastic mold, *oil (see page 2), shower gel, teaspoon measuring spoon*

HERE'S HOW

1. Measure 28 ml of starch using the small beaker. Pour it into the large beaker.
2. Measure 10 ml of your favorite shower gel with the small beaker. Add it to the large beaker.
3. Add a quarter teaspoon of salt to the large beaker.
4. Add a few drops of red or blue cosmetic dye.
5. Mix the ingredients in the large beaker. If the shower dough is too runny, add a bit of starch. If it's too stiff, add some more shower gel.
6. Dust the cavities of the plastic mold with starch and then press the dough into the molds. Let it harden.
7. When the shower dough shapes have hardened enough to remove them from the molds, you can remove them. You can use them like bars of soap.



EXPERIMENT 13

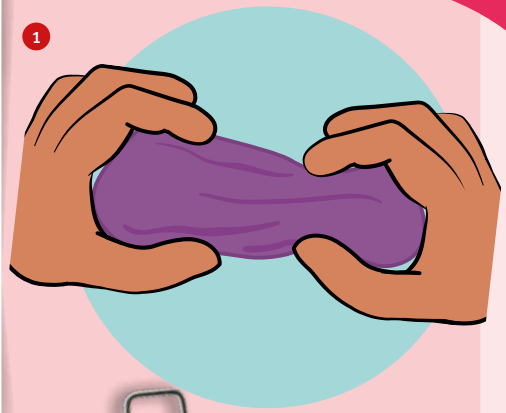
Liquid or solid?

YOU WILL NEED

Shower dough from Experiment 12

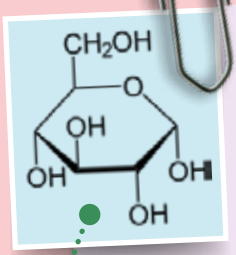
HERE'S HOW

1. Try pulling the shower dough apart slowly, and then quickly. What do you observe happens to the shower dough?

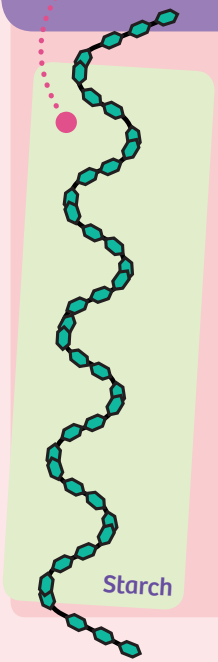


What Is Starch?

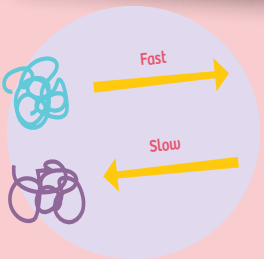
Why does the shower dough break when you pull it quickly but stretch when you pull it slowly? A substance called starch gives it this property. Starch belongs to a group of molecules called **polymers.**



A single polymer molecule is made up of hundreds of thousands of repeating units known as monomers. The monomers may be identical or they may vary. The monomer in starch is a sugar molecule called **glucose.**



The long chains of starch molecules are normally all coiled up, so pulling on the shower dough quickly causes the starch molecules to become entangled with each other and break apart. But when you pull on the shower dough slowly, the starch molecules are able to slide past each other easily and the dough stretches instead of breaking.



Plants use starch as a way to store energy. They can add more glucose molecules to the chain when they want to store energy and remove them when they need to burn energy.

EXPERIMENT 14

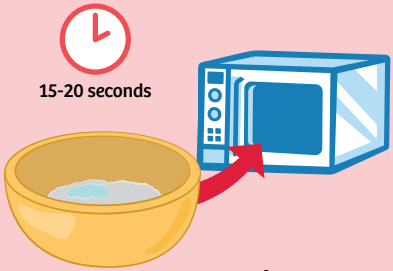
Shower jellies

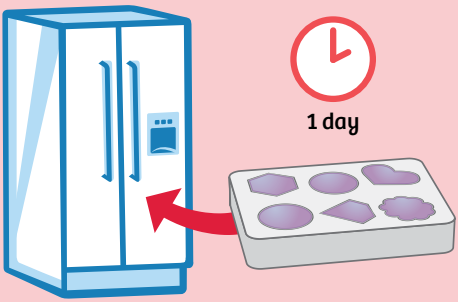
YOU WILL NEED

Large beaker, stirring rod, plastic mold, *gelatin powder, water, teaspoon, tablespoon, shower gel, microwave, bowl, refrigerator*

HERE'S HOW

1. Place 10 grams (about 3 teaspoons) of gelatin powder and 5 tablespoons of water in a microwave-safe bowl.
2. Wait for five minutes.
3. Heat the mixture in the microwave until the gelatin becomes liquid (about 15–20 seconds).
4. Measure 120 ml of your favorite shower gel and 120 ml of lukewarm water and add these to the bowl.
5. Mix it well with the stirring rod and pour it into the plastic mold.
6. Let it cool down and harden in the refrigerator for one day.
7. Now your shower jellies are ready to use. You can use them like a bar of soap.





EXPERIMENT 15

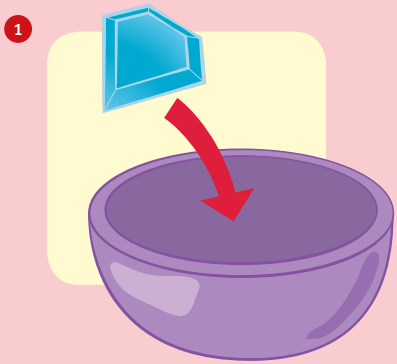
Shower jelly experiment

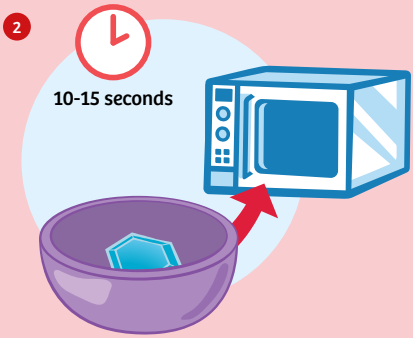
YOU WILL NEED

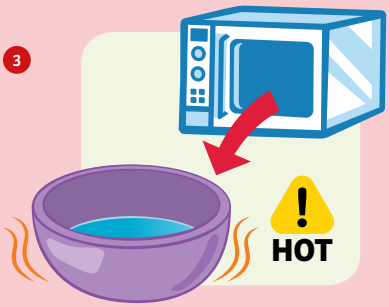
Shower jelly from Experiment 14, *microwave-safe bowl, microwave, refrigerator*

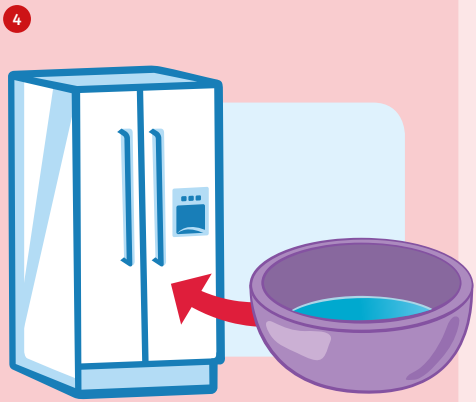
HERE'S HOW

1. Take one shower jelly and place it in a microwave-safe bowl.
2. Place the bowl in the microwave for 10–15 seconds.
3. Take the bowl out of the microwave. Be careful as the bowl may be hot! Record your observations of what happened to the shower jelly.
4. Place the microwaved jelly into the refrigerator for 1–2 hours. Then take it out again. Record your observations again.





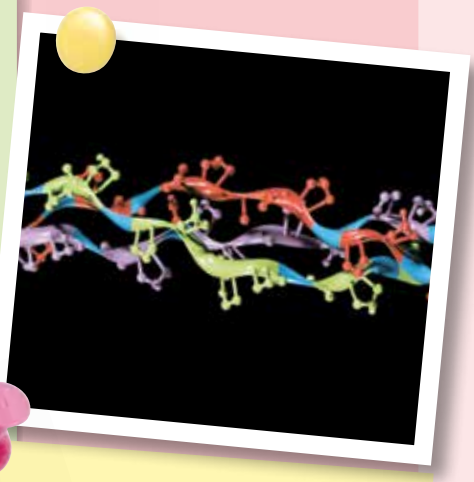




CHECK IT OUT

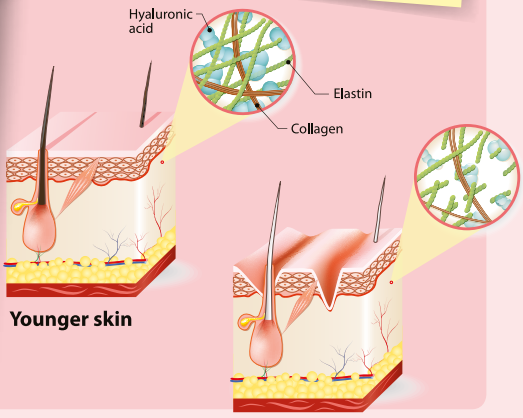
Collagen

Another natural polymer is **collagen.** Collagen functions very differently than starch. Collagen fibers form bundles that give cells structure. This is why collagen is found in tissues such as tendons, ligaments, and skin. The **gelatin** used in the shower jelly is mainly made up of collagen molecules that have been irreversibly cut.



Gelatin has the ability to swell up in cold water and to be dissolved when heated. And, as soon as it is cooled off again, it forms a "reversible" gel. That means it can return to an earlier state. Parts of a collagen molecule are responsible for its firm structure, while other parts bond with water molecules. In warm water, the water molecules can slide in between the collagen molecules and fold their inner structure together. This is when the gelatin is dissolved. When cooled off, the collagen molecules connect themselves together again and, as a result, form a network that can make liquids firm.

In young skin, there is a fine balance between collagen production and collagen removal. With age, this balance shifts as more and more collagen is removed and not replaced. Thus, the older you get, the drier your skin becomes. The surface layer gets thinner and thinner and the re-supply of new skin cells takes almost twice as long as in youth, causing wrinkles to appear and intensify. And on much older people, dark-colored spots, or age spots, can occur.



EXPERIMENT 16

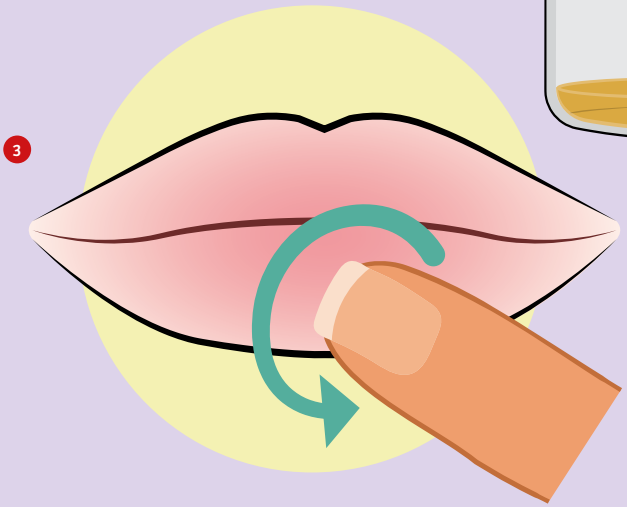
Lip rub

YOU WILL NEED

Cream pot, stirring rod, *teaspoon, honey, sugar*

HERE'S HOW

1. Measure 2 teaspoons of sugar and 1 teaspoon of honey into the cream pot.
2. Mix the sugar and honey with the stirring rod.
3. Put a small drop of the lip rub onto your lips and massage it in a circular motion for 1–2 minutes. Remove it with water and use a lip balm afterward.



CHECK IT OUT

Read My Lips

By looking at the lips, we can see whether someone is sulky, happy, sad, or defensive. Many emotions are revealed by the mouth and shape of the lips. Even certain character traits are associated with the shape of the lips and the color you select for lipstick.

So, whether they are naturally pink like roses or red like cherries, it is no mystery why the mouth has always been emphasized with cosmetics.

After you brush your teeth, massage the lips gently with the toothbrush. This will remove the tiniest skin flakes and also make the skin of the lips soft and rosy.

CARE AND PAMPERING

The best way to care for your lips is to avoid dry air, bright direct sunlight, harsh winds, and cold weather. These all have an unpleasant effect on the lips. When exposed, lips can become raw or brittle, and sometimes the thin skin can crack or flake off and start bleeding.

DELICATE SKIN

Have you smiled today? If so, how did your lips feel? Soft and supple, or raw and brittle?

The lips are one of the most sensitive parts of the skin. The skin on the lips is so thin and delicate that the tiny blood vessels behind it can show right through it, giving it a reddish hue. Lips do not have any protective hair, nor any sweat or fat glands. This means that they can hardly produce any moisture and that they therefore dry out quickly. On top of that, they cannot grease themselves.

The lips are seven times more sensitive to touch than your fingertips. This is why you can sense temperature differences most acutely with your lips. It is also why chapped lips can hurt so much.

Did You Know? The ancient Egyptians were true makeup artists. Women and men alike colored their lips with henna or a red, grease-containing paste of cinnabar. By the way, the red color for Cleopatra's lip balm came from a small snail with a rich purple shell.

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