



Soap & Bath Bomb Lab



WARNING. Not suitable for children under 6 years. For use under adult supervision. Read the instructions before use, follow them and keep them for reference.

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Safety Information

Warning!

- **CAUTION:** Functional components may produce sharp edges when broken. Handle with care. 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.

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 larger 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

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.

Ingredients

Glycerin soap: Propylene glycol, Sorbitol, Myristic acid, Stearic acid, Water, Sodium hydroxide, Glycerin, Lauric acid, Palmitic acid, Sodium bicarbonate, Tetrasodium EDTA

Potassium phosphate
(Potassium dihydrogen phosphate)

Sodium bicarbonate (Sodium hydrogen carbonate)

Red dye powder: FD&C Red #40, Sodium chloride (table salt), Sodium sulfate

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Science Fact vs. Science Fiction

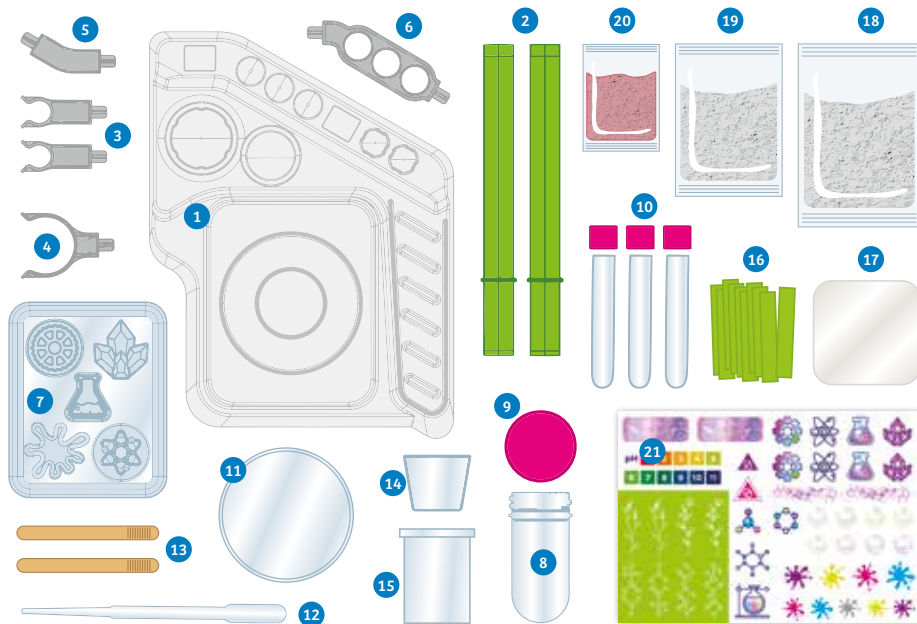
The science experiments and explanations in this manual are real. The storyline about the cosmetics company is purely fictional and intended only to make the scientific experimentation more fun and playful.



>>> KIT CONTENTS

Good to know! If you are missing any parts, please contact Thames & Kosmos customer service.

What's inside your experiment kit:



Checklist: Find – Inspect – Check off

✓	No.	Description	Qty.	Item No.
<input type="radio"/>	1	Base station	1	722025
<input type="radio"/>	2	Vertical rod	2	721965
		Set of small plastic parts:		722956
<input type="radio"/>	3	16-mm holder clip	2	
<input type="radio"/>	4	38-mm holder clip	1	
<input type="radio"/>	5	Station connector piece	1	
<input type="radio"/>	6	Test tube holder	1	
<input type="radio"/>	7	Mold tray	1	722030
<input type="radio"/>	8	Large test tube	1	717119
<input type="radio"/>	9	Lid for large test tube	1	722031
<input type="radio"/>	10	Small test tube with lid	3	722032
<input type="radio"/>	11	Petri dish	1	715232
<input type="radio"/>	12	Pipette	1	714772
<input type="radio"/>	13	Spatula	2	721959
<input type="radio"/>	14	Measuring cup, 30 ml	1	714771
<input type="radio"/>	15	Beaker with lid	1	718763
<input type="radio"/>	16	pH test strip	10	722033
<input type="radio"/>	17	Glycerin soap block (100 g / 3.5 oz)	1	722035

✓	No.	Description	Qty.	Item No.
<input type="radio"/>	18	Sodium bicarbonate (Sodium hydrogen carbonate) (40 g / 1.41 oz)	1	722036
<input type="radio"/>	19	Potassium phosphate (Potassium dihydrogen phosphate) (30 g / 1.05 oz)	1	722037
<input type="radio"/>	20	Red dye powder (1 g / 0.03 oz)	1	722034
<input type="radio"/>	21	Sticker sheet	1	722024

You will also need: Mild soap, water, cosmetic tissues, mirror, fresh or dried flowers or herbs (see Experiment 1 for suggestions), oil (see Experiment 1 for suggestions), coffee filter, dish soap, knife, scissors, microwave, small microwave-safe glass bowl, coffee grounds, paper towel, oven, baking sheet, aluminium foil, perfume oil, sink, and a regularly equipped kitchen. Read through each experiment to make sure you have everything you need for the experiment.

>>> SAFETY INFORMATION

Advice for Supervising Adults

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, 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 and waiting 24 hours. 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 front cover, you will find a detailed list of all the chemical ingredients contained in this kit. You should check this for known allergic reactions.

- A. This chemical toy is not suitable for children under 6 years. For use under adult supervision. Keep this chemical toy set out of reach of children under 6 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 alkalis, 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.

Any materials not included in the kit are marked in *italics* in the "You will need" sections.



Safety Rules

The first thing a lab researcher does is get an overview of what he or she will be doing. All of the experiments described in this manual can be performed without risk, as long as you conscientiously adhere to the advice and instructions. Read through the following information very carefully. Think about everything that you will need. Always pay attention to the safety notes that accompany an experiment.

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.

If you have any questions about the experiments, your parents or older siblings will be able to help you.

Now let's get started. Have fun with the experiments!

Information about Hazardous Substances

None of the substances in this kit are classified as hazardous substances in the quantities included and the applications presented in this kit. However, you must read these safety instructions before use, follow them, and keep them for reference.

WARNING. The following applies to all chemicals:

- Do not ingest.
- Wash hands thoroughly after handling.
- Use only as instructed. Read cautions in this manual carefully.
- Store locked up. Keep out

of reach of children. This primarily applies to young children, but also to older children who — unlike the experimenter — have not been appropriately instructed by adults.

The following applies to all powdered chemicals:

- Do not get in eyes or on clothing.
- Avoid breathing dust.

Also follow this precautionary statement:

- **IF SWALLOWED:** Get immediate medical advice/attention and have product container or label of chemical substance at hand.

Here is additional information specific to each chemical in this kit:

Glycerin Soap
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Potassium phosphate
(Potassium dihydrogen phosphate)
No additional information

Red dye powder
No additional information

Sodium bicarbonate (Sodium hydrogen carbonate)
No additional information

>>> INTRODUCTION

HELLO LAB RESEARCHER!

Welcome to our bath and body product development lab. Here we develop all sorts of products for cleaning, healing, and beautifying the body. Safety and quality are of the utmost importance.

Thanks for joining us to assist in our development efforts. We have a series of research experiments that we would like you to conduct. Your research will help us improve our products.

Follow the instructions in this manual to complete the experiments. Note the five assignments. When you are finished with the assignments, please record your results to report back to us. Happy experimenting!

ASSIGNMENT 1: What type of essential oil do you recommend we use in our soaps and bath bombs?

ASSIGNMENT 2: How do you recommend we get oil and water to stay mixed in our new lotion product?

ASSIGNMENT 3: Which of the four molded soap products do you recommend we include in our new line of soap and why?

ASSIGNMENT 4: Please report back on the pH measurements for the glycerin soap, potassium phosphate, and sodium bicarbonate.

ASSIGNMENT 5: Did the bath bomb product work as you expected? What was the result and how could you improve it?

Good luck! — Global Chemical Products Research Team





Lab Station Assembly

Before starting any experiments, follow these instructions to put your Lab station together.

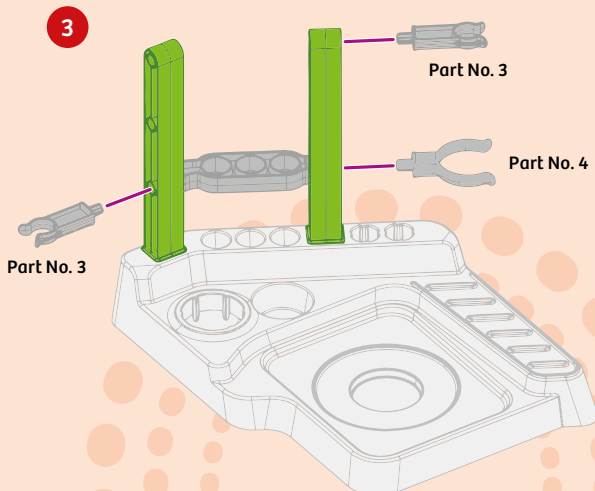
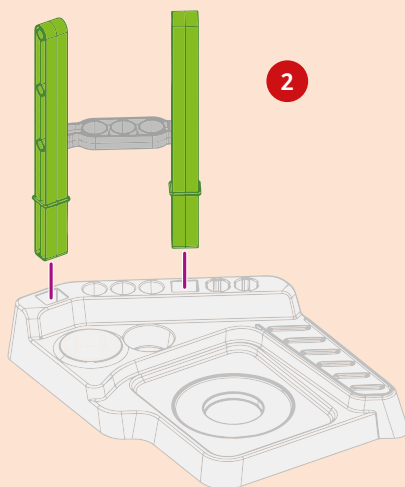
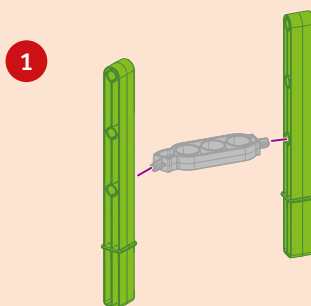
YOU WILL NEED

All of the pieces of the Lab station

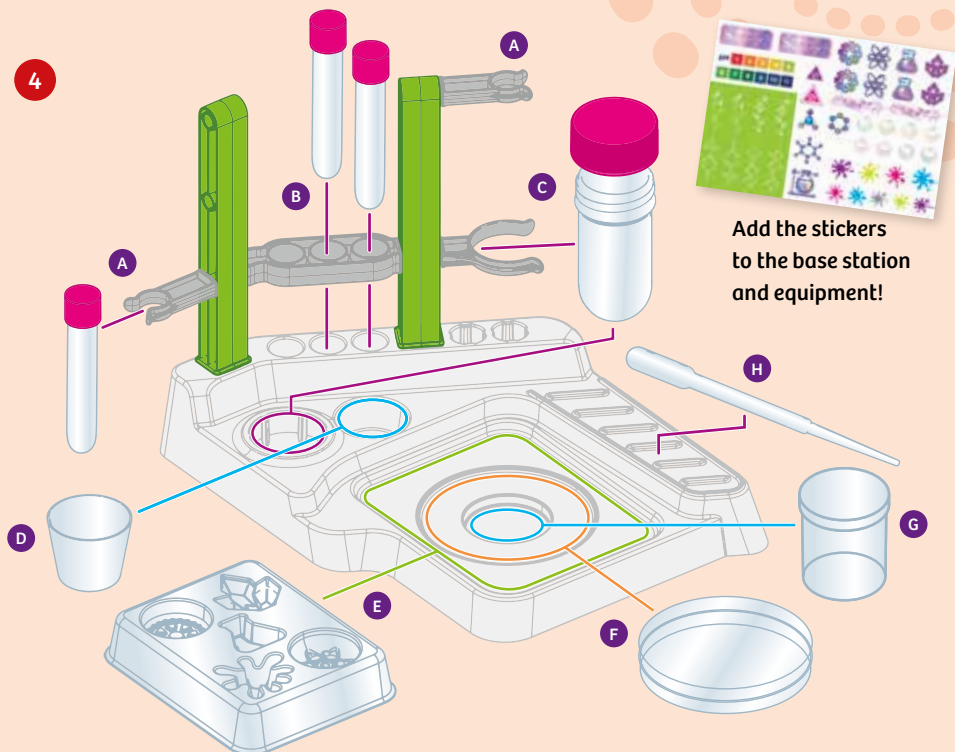
HERE'S HOW

- 1 Insert the test tube rack into two vertical rods as shown.
- 2 Insert the two vertical rods into the station base as shown.
- 3 Insert the three clips (part numbers 3 and 4 from the kit contents list) into the vertical rods. They are all moveable and can be repositioned for experiments as needed.
- 4 The tools and equipment can be positioned on the station in different places depending on the experiment. This image shows the locations where specific items are designed to fit.

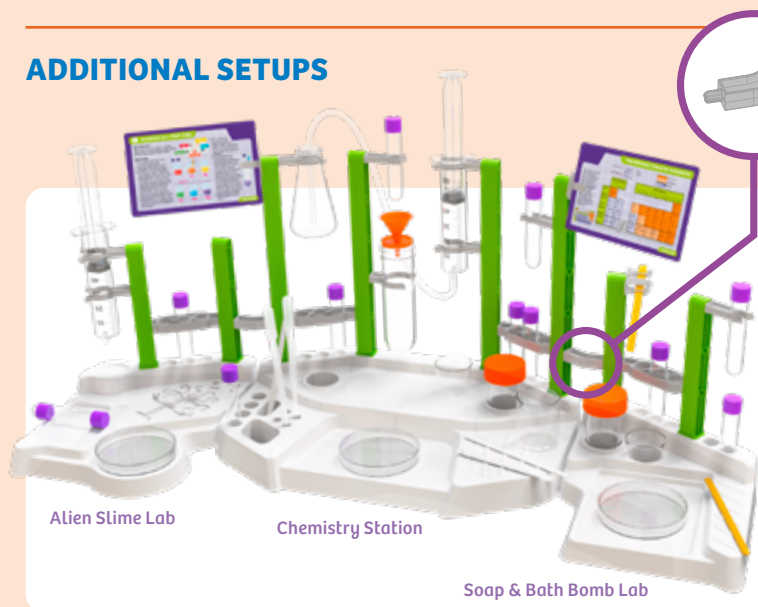
- A Small test tube clip
- B Small test tube rack
- C Large test tube clip
- D Measuring cup holder
- E Mold tray recess
- F Petri dish recess
- G Beaker recess
- H Tool rack and drying rack



>>> INTRODUCTION



ADDITIONAL SETUPS



If you have other Ooze Labs kits, you can connect them together to create one larger experiment station! Use the connector piece to attach the rods together as shown.



>>> SKIN TYPE IDENTIFICATION

PREPARATION

Before you begin your assignments, please conduct this experiment to better understand how cosmetics are designed for different skin types.

Skin types

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?

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.



Combination skin type: Your skin will feel tight to begin with, but will feel normal after the hour. 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.

>>> SKIN TYPE IDENTIFICATION

THE COMBINATION SKIN TYPE ...

... is the most prevalent skin type. Even though 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 blemishes (which can often happen during puberty), you should use cosmetics designed especially for greasy skin.

A non-oily moisturizing face wash, special creams, and 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.

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.

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.

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 even 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.

Make scented oils

YOU WILL NEED

Small test tube, measuring cup, base station, 1 teaspoon (5 ml) of fresh or dried flowers or herbs (such as lavender, rose, mint, rosemary, vanilla, or citrus peels), 1 teaspoon (5 ml) of 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), coffee filter

HERE'S HOW

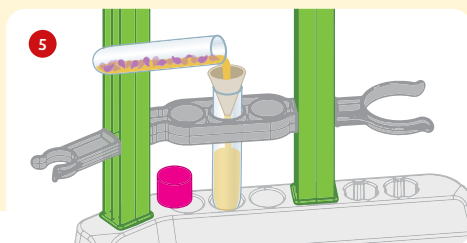
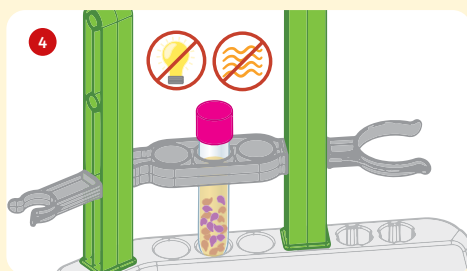
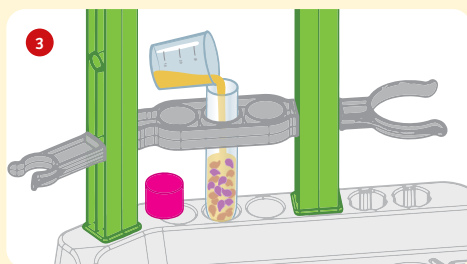
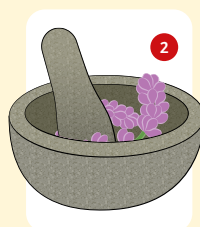
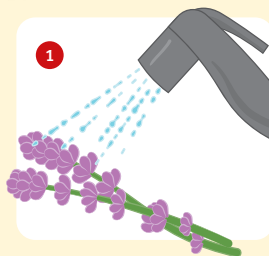
- 1 If you are using fresh flowers or herbs, wash them first. Then thoroughly dry them. It is important that no moisture is introduced into the oil, as the oil may become rancid or start to grow mold or bacteria.
- 2 Gently crush or chop the flower petals or herbs into small pieces.
- 3 Place the small test tube into the test tube holder in the base station. Put about 1 teaspoon of the plant materials into the test tube. Add approximately 5 ml of oil, or enough to cover the flowers or herbs completely.
- 4 Let the jar sit in a cool, dark, and dry place for two or three days.
- 5 Afterward, pour the oil and dried flowers through a filter paper sheet, such as a coffee filter, folded into a cone and into another test tube. This will filter out the solid pieces of flowers or herbs. Keep the oil and discard the filtered-out solid pieces.

WHAT'S HAPPENING ?

You made a simple infused oil. **Infusion** is the process of extracting chemical compounds or fragrances from plant materials in a solvent such as water, oil, or alcohol.

ASSIGNMENT 1:

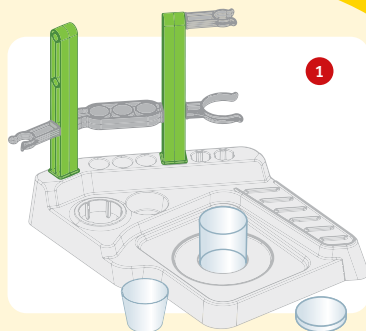
What type of infused oil do you recommend we use in our soaps and bath bombs?



>>> EXPERIMENT 2

ASSIGNMENT 2:

How do you recommend we get oil and water to stay mixed in our new lotion product?



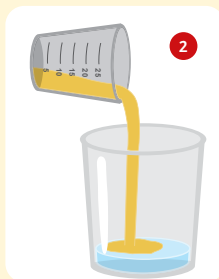
Oil and water

YOU WILL NEED

Large beaker, measuring cup, spatula, *oil (any type), water*

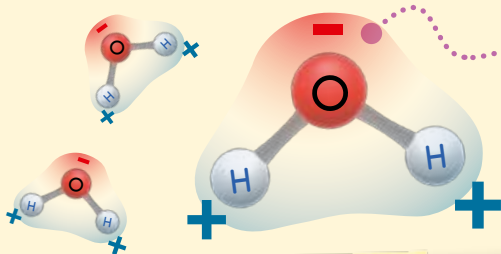
HERE'S HOW

- 1 Place the beaker in the recess in the base station.
- 2 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?
- 3 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.

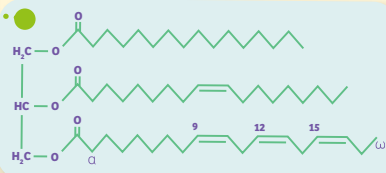


WHAT'S HAPPENING?

The oil and water do not mix on their own, and they separate even after they have been manually mixed together. 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.

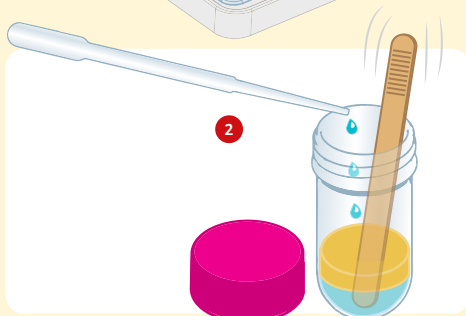
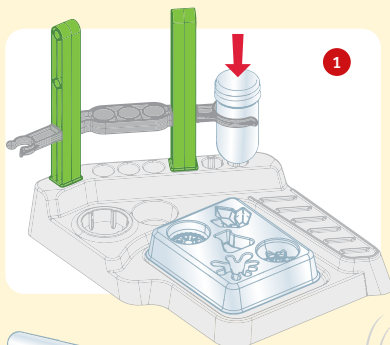
Emulsions

YOU WILL NEED

Large test tube, lid, oil and water from previous experiment, pipette, spatula, *dish soap*

HERE'S HOW

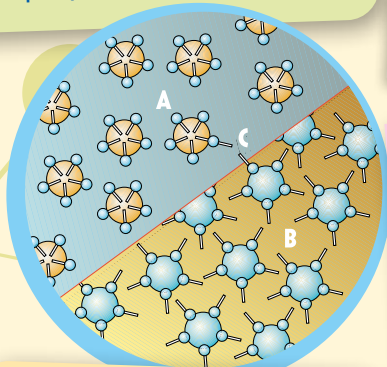
- 1 Put the large test tube in the base station.
- 2 Put the oil and water mixture into the test tube. Using the pipette, add a few drops of dish soap. Shake the liquids in the tube with the lid on until thoroughly mixed. Let it sit for 30 minutes. Observe what happens. Wash all the equipment well.



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-loving) 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 4

ASSIGNMENT 3:

Which of the four molded soap products do you recommend we include in our new line of soap and why?

Make molded glycerin soaps

YOU WILL NEED

Mold tray, base station, glycerin soap, pipette, perfume oil from Experiment 1, spatula, *knife*, microwave, *small microwave-safe glass bowl*

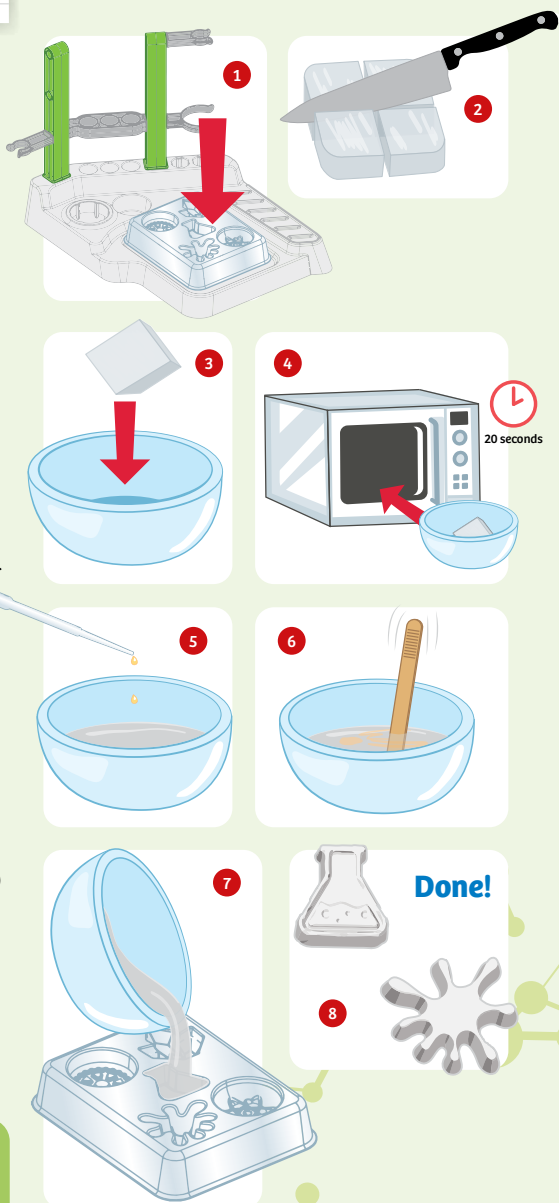
HERE'S HOW

- 1 Put the soap mold tray into the recess in the base station.
- 2 Have an adult cut the glycerin soap block into four pieces.
- 3 Place one piece of glycerin soap in the small microwave-safe glass bowl.
- 4 Heat the glycerin soap in a microwave for approximately 20 seconds, or until it is a liquid.
- 5 Add a few drops of perfume oil from Experiment 2 (or your own perfume oil).
- 6 Mix with the spatula.
- 7 When it is mixed, pour the mixture into a few molds in the tray — as many as you can fill with the amount of soap mixture.
- 8 Wait 1–2 hours for the soap to cool and harden. Then, the molded soaps can be popped out of the molds. You can place them on the drying rack and then use them.

Clean up: You can wash the microwave-safe bowl, mold tray, and other tools in the sink with some warm water.



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



Colorful molded soaps

YOU WILL NEED

Mold tray, base station, glycerin soap, red dye powder, small test tube, spatula, pipette, water, microwave, small microwave-safe glass bowl

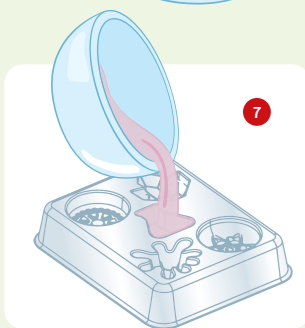
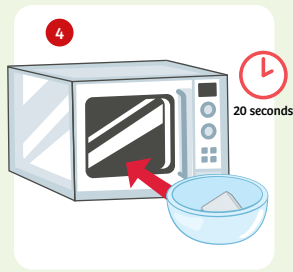
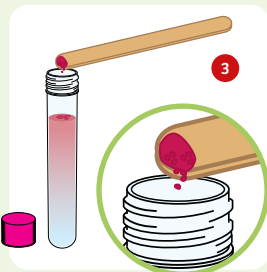
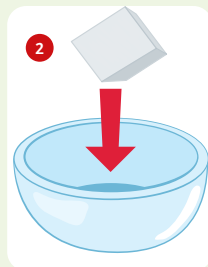
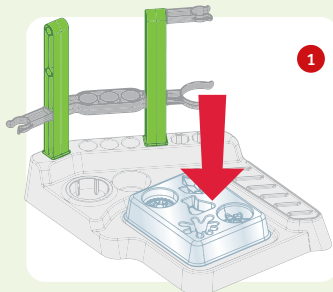
HERE'S HOW

- 1 Put the soap mold tray into the recess in the base station.
- 2 Place one piece of glycerin soap in the small microwave-safe glass bowl.
- 3 Mix a very small amount of dye powder (the tip of the spatula) with 5 ml of water in the small test tube.
- 4 Heat the glycerin soap in a microwave for approximately 20 seconds, or until it is a liquid.
- 5 Add a few drops of the dye solution to the heated soap mixture using the pipette.
- 6 Mix with the spatula.
- 7 When it is mixed, pour the mixture into a few molds in the tray — as many as you can fill with the amount of soap mixture.
- 8 Wait 1–2 hours for the soap to cool and harden. Then, the molded soaps can be popped out of the molds.

Clean up: You can wash the microwave-safe bowl, mold tray, and other tools in the sink with some warm water.

! 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.

Caution! The red dye powder is very potent and can stain clothing, work surfaces, and other materials. Handle with care.



>>> EXPERIMENT 6

Botanical soaps

YOU WILL NEED

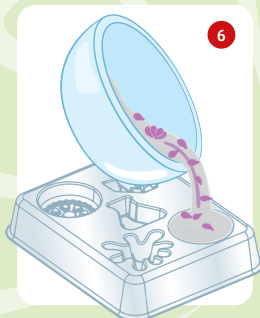
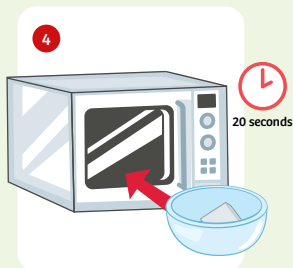
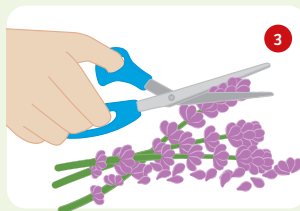
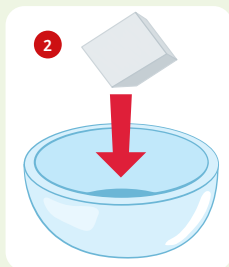
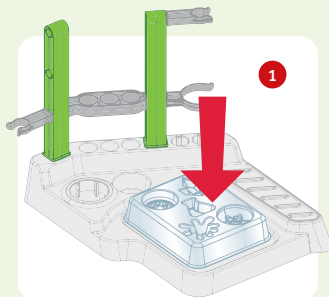
Mold tray, base station, glycerin soap, spatula, scissors, microwave, small microwave-safe glass bowl, 2 teaspoons (10 ml) of fresh or dried flowers or herbs (such as lavender, rose, mint, rosemary, vanilla, or citrus peels)

HERE'S HOW

- 1 Put the soap mold tray into the recess in the base station.
- 2 Place one piece of glycerin soap in the small microwave-safe glass bowl.
- 3 If you are using fresh flowers or herbs, wash them first. Then thoroughly dry them. Gently crush or cut the flower petals or herbs into small pieces with scissors.
- 4 Heat the glycerin soap in a microwave for approximately 20 seconds, or until it is a liquid.
- 5 Add the plant materials to the heated soap mixture. Mix with the spatula.
- 6 When it is mixed, pour the mixture into a few molds in the tray — as many as you can fill with the amount of soap mixture.
- 7 Wait 1–2 hours for the soap to cool and harden. Then, the molded soaps can be popped out of the molds.



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, mold tray, and other tools in the sink with some warm water.

Coffee soaps

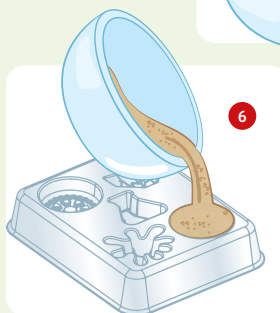
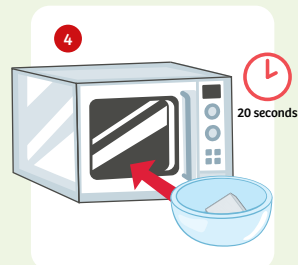
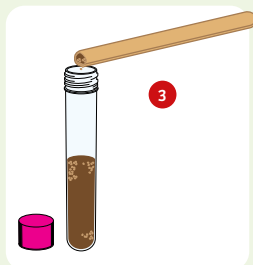
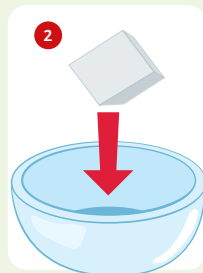
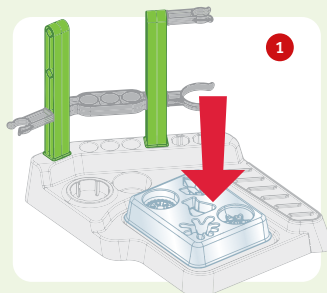
YOU WILL NEED

Mold tray, base station, glycerin soap, small test tube, spatula, *microwave*, *small microwave-safe glass bowl*, *already-brewed coffee grounds*, *paper towel*

HERE'S HOW

- 1 Put the soap mold tray into the recess in the base station.
- 2 Place one piece of glycerin soap in the small microwave-safe glass bowl.
- 3 Measure out about 1 teaspoon (5 ml) of already-brewed coffee grounds in the small test tube. Dry the grounds in a paper towel.
- 4 Heat the glycerin soap in a microwave for approximately 20 seconds, or until it is a liquid.
- 5 Add the coffee grounds to the heated soap mixture. Mix with the spatula.
- 6 When it is mixed, pour the mixture into a few molds in the tray — as many as you can fill with the amount of soap mixture.
- 7 Wait 1–2 hours for the soap to cool and harden. Then, the molded soaps can be popped out of the molds.

! 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, mold tray, and other tools in the sink with some warm water.

Which soap do you like best? The fragrant perfumed soap, the colorful pink soap, the natural plant-based soap, or the refreshing and mildly abrasive coffee soap?

>>> CHECK IT OUT



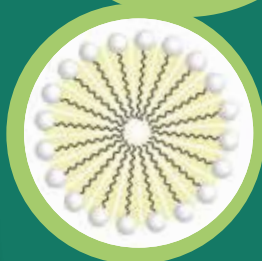
How Does Soap Work?

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.

carboxyl group =
hydrophilic



hydrocarbon chain =
hydrophobic



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!



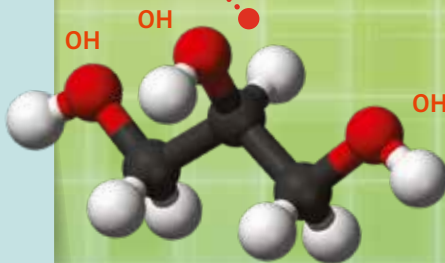
Artificially-made soaps are called **detergents**. These are not like normal soaps made from natural fats. They are made from synthetic deterging agents. Detergents change the pH value of the skin only a little, but they degrease it more than normal soaps.

CHECK IT OUT

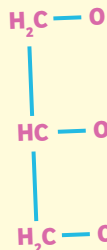


What Is Glycerin?

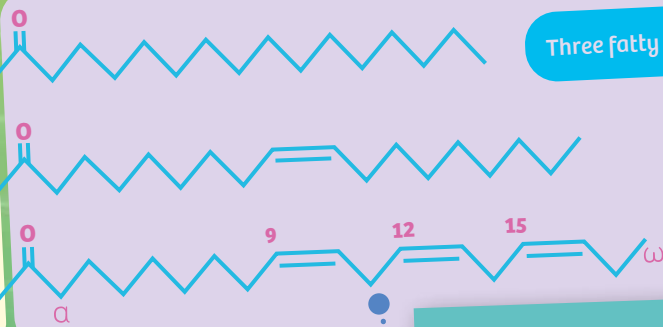
Glycerin, also known as **glycerol**, is an organic compound with the chemical formula $C_3H_8O_3$. Glycerin has three hydroxyl groups (OH) which make it a polar molecule. This is why glycerin is soluble in water.



Glycerol



Three fatty acids



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** ($-COOH$).

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!

Stearic Acid

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



>>> EXPERIMENT 8

ASSIGNMENT 4:

Please report back on the pH measurements for the three materials listed below.

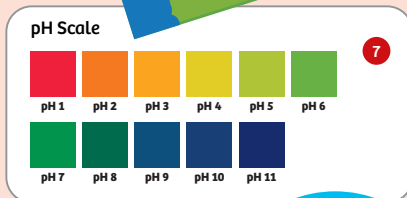
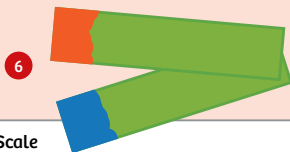
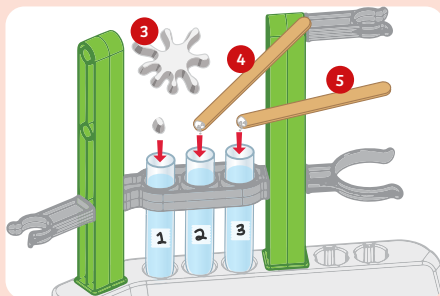
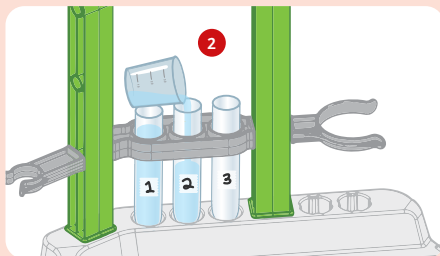
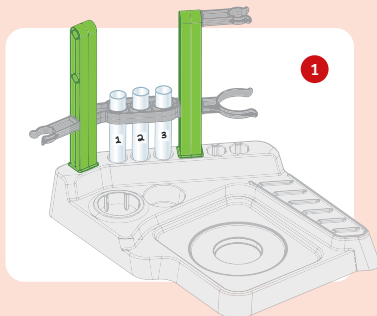
Testing acidity with pH test strips

YOU WILL NEED

3 small test tubes, tape, marker, base station, glycerin soap, potassium phosphate, sodium bicarbonate, pH test strips, *water*

HERE'S HOW

- 1 Number each test tube with a piece of tape and a permanent marker. Place the test tubes in the test tube holder on the base station.
- 2 Fill all three test tubes with water.
- 3 Place a small piece of the glycerin soap from Experiment 7 in test tube 1. Shake the test tube with the lid on to dissolve the soap.
- 4 With the spatula, scoop up a small amount of potassium phosphate. Put it into test tube 2 and stir or shake until it is dissolved.
- 5 Put a scoop of sodium bicarbonate into test tube 3 and stir or shake until it is dissolved.
- 6 Dip the end of a pH strip into the solution in test tube 1. Place it on the drying rack. Repeat with new test strips for the other two test tubes.
- 7 Observe the colors. Compare the colors of the pH strips to the colors on the scale to the right to determine the pH value of the two liquids. Read about pH on the next page.



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



>>> CHECK IT OUT

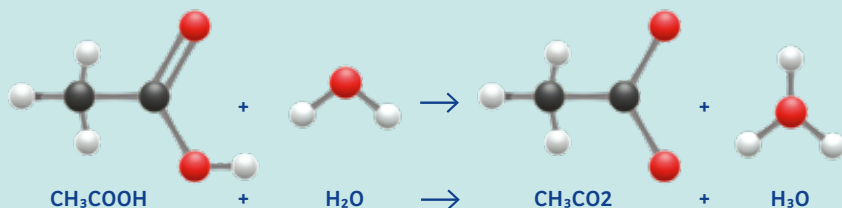


Acids and Bases



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.

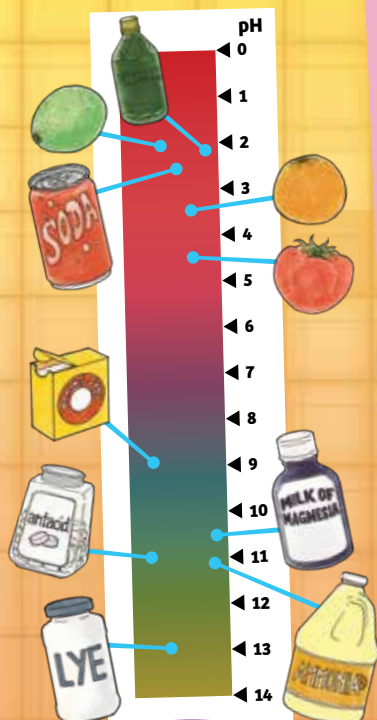
An **acid** is a substance that releases hydrogen ions (H^+) when dissolved in water. **Bases** are chemicals that release hydroxide ions (OH^-) when dissolved in water. You encounter many acids and bases every day. The vinegar and lemon juice you use to flavor food, the hydrochloric acid in your stomach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

ASSIGNMENT 5:

Did the bath bomb product work as you expected?
What was the result and how could you improve it?

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

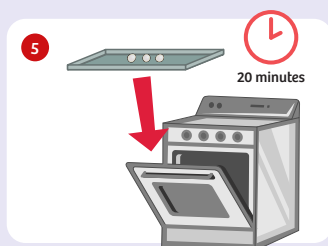
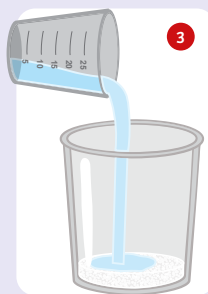
Fizzing bath bombs

YOU WILL NEED

Large beaker, measuring cup, sodium bicarbonate, potassium phosphate, molding tray, pipette, spatula, *water, oven, baking sheet, aluminium foil, perfume oil*

HERE'S HOW

- 1 Measure 15 ml of sodium bicarbonate with the measuring cup. Then pour it into the large beaker.
- 2 Measure 7 ml of potassium phosphate and pour it into the large beaker. Stir the two powders together.
- 3 Add 3 ml of water and stir quickly.
- 4 Form a small ball with your hands, or mold the mixture in the mold tray. Remove the molded bath bombs from the mold tray before the next step.
- 5 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.
- 6 When they have cooled, put a few drops of perfume oil from Experiment 1 on them using the pipette.



>>> EXPERIMENT 10

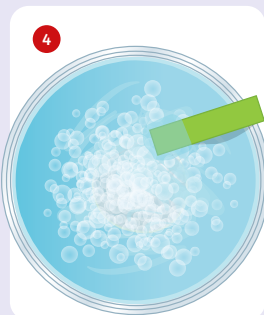
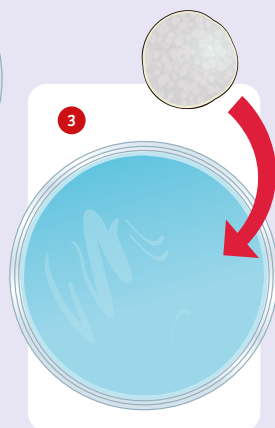
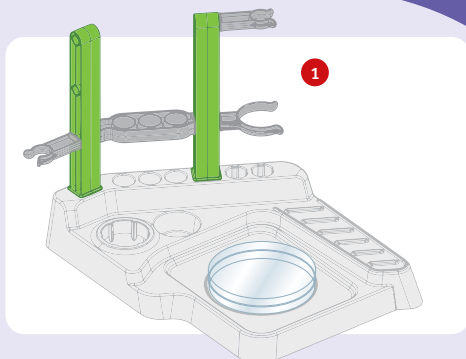
Fizzy bath bomb experiment

YOU WILL NEED

Bath bomb from Experiment 9, pH test strip, petri dish, *water*

HERE'S HOW

- 1 Put the petri dish in the petri dish recess on the base station.
- 2 Fill the petri dish with water.
- 3 Place the bath bomb into the water in the petri dish.
- 4 Observe the amount of bubbling that the bath bomb produces. Then dip the pH test strip into the water and read the pH level.



WHAT'S HAPPENING?

The bubbling of the bath bomb is caused by a **chemical reaction** that is taking place in the petri dish. The fizzing is an indication of this reaction. In the petri dish, the sodium bicarbonate (also known as sodium hydrogen carbonate), which is a base, is reacting with the potassium phosphate (also known as potassium dihydrogen phosphate), an acid. One of the products of this reaction is **carbon dioxide** gas (the bubbles). Sodium bicarbonate and potassium phosphate are sometimes used as a leavening agent — also known as **baking powder**. When added to dough, the gas that escapes during the reaction causes the dough to rise. Baking powder is used to make cakes, cookies, brownies, and quick breads rise.



>>> CHECK IT OUT



The Skin: Our Largest Organ

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.

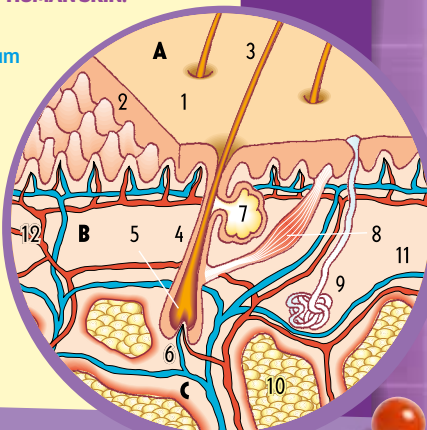
SURPRISING FACTS ABOUT THE SKIN

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. This 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



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.



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