EXPERIMENT MANUAL

Yummy Rainbow Lip Balm Lab

WARNING! Not suitable for children under 8 years. For use under adult supervision. Contains some chemicals which present a hazard to health. Read the instructions before use, follow them and keep them for reference. Keep small children and animals away from experiments. Keep the kit out of reach of children under 8 years old. Contains glass that may break. Contains fragrances that may cause allergies. Discontinue using if irritation occurs. The liquid coloring may stain. When using the kit, do not work near, or apply to, textiles or furniture.

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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Checklist:

J	No.	Description	Quantity	Part No.
0	1	Red cosmetic dye, 2 g (0.07 oz)	1	550040-1
0	2	Yellow cosmetic dye, 2 g (0.07 oz)	1	550040-2
0	3	Blue cosmetic dye, 2 g (0.07 oz)	1	550040-3
0	4	Petroleum jelly, 16 g (0.56 oz)	1	550040-22
0	5	Berry wax, 4 g (0.14 oz)	1	550040-5
0	6	Strawberry flavor, artificial, 2 ml (0.07 fl oz) 1	550040-6
0	7	Banana flavor, artificial, 2 ml (0.07 fl oz)	1	550040-7
0	8	Grape flavor, artificial, 2 ml (0.07 fl oz)	1	550040-8
0	9	Large spoon	1	550040-12
0	10	Small measuring spoon, 1-ml	1	550040-13
0	11	Spatula (stirring stick)	3	550040-14
0	12	Lip balm jar with lid	6	550040-15
0	13	Sticker sheet	1	550040-15A
0	14	Measuring cup, 30-ml	1	550040-16
0	15	Measuring cup, 110-ml	1	550040-17
0	16	Baby oil, 25 ml (0.84 fl oz)	1	550040-18
0	17	Lip gloss bottle with roll-on applicator	2	550040-20
0	18	Laboratory station	1	550040-21

The parts not included in the kit are marked in *italics* in the YOU WILL NEED lists at the beginning of each experiment.

YOU WILL ALSO NEED:

Water, microwave, oven mitt or potholder, sheet of white paper

INGREDIENTS: PETROLEUM JELLY (NET WT. 16 g/0.56 OZ; Petrolatum, Caprylyl glycol, Chlorphenesin), BABY OIL (25 mL/ 0.84 FL OZ; Paraffinum liquidum (Mineral oil / Huile minérale), Tocopheryl acetate, Caprylyl glycol), BERRY WAX (NET WT. 4 g/ 0.14 OZ; Rhus verniciflua peel cera (Rhus verniciflua peel wax), OIL BASED YELLOW COLOR (NET WT. 2 g/0.07 0Z; Paraffinum liquidum (Mineral oil / Huile minérale), Tocopheryl acetate, Caprylyl glycol, Yellow 5 / CI 19140), OIL BASED RED COLOR (NETWT. 2g/0.07 OZ; Paraffinum liquidum (Mineral oil / Huile minérale), Tocopheryl acetate, Caprylyl glycol, Red 40 / Cl 16035), OIL BASED BLUE COLOR (NET WT. 2 g / 0.07 OZ; Paraffinum liquidum (Mineral oil / Huile minérale), Tocopheryl acetate, Caprylyl glycol, Blue 1 Lake / CI 42090), STRAWBERRY FLAVOR (2 mL/0.07 FL OZ; PEG-7 Glyceryl cocoate, Fragrance /Parfum, Caprylyl glycol), BANANA FLAVOR (2 mL/0.07 FL OZ; PEG-7 Glyceryl cocoate, Fragrance / Parfum, Caprylyl glycol), GRAPE FLAVOR (2 mL/0.07 FL 0Z; PEG-7 Glyceryl cocoate, Fragrance / Parfum, Caprylyl glycol).

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Set up your own cosmetic lab station!

* Tip

YOU CAN FIND LOTS OF INTERESTING SCIENTIFIC EXPLANATIONS AND BACKGROUND INFO IN THE "CHECK IT OUT" SECTIONS ON PAGES 15 AND 16.





Discover the chemistry behind how lip balms work!

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Learn about the biology of skin and lips!

SAFETY INFORMATION



WARNING!

Not suitable for children under 3 years old. Small parts — Choking hazard. Keep the packaging and instructions as they contain important information. HOT WATER / MICROWAVE OVEN: The oil mixtures must be melted in a hot water bath. The water needs to be heated above 60 °C in a kettle or in a beaker in a microwave. A responsible adult should supervise the heating of the water in a microwave or kettle, and the safe use of the hot water.

External use only. Do not eat the ingredients or the products. Avoid contact with the eyes.

Safety Rules

- \rightarrow ALLERGEN INFORMATION: No milk, egg or shellfish products used. Manufactured on machinery that is also in contact with macadamia nut oil. We do not recommend this product if your child has skin infections or skin allergies.
- \rightarrow Clean all equipment after use.
- \rightarrow Make sure that all containers are fully closed and properly stored after use.
- \rightarrow Ensure that all empty containers are disposed of properly.
- \rightarrow Wash hands after carrying out experiments.
- ightarrow Do not use any equipment which has not been supplied with the set or recommended in the instructions for use.

First Aid Information

- \rightarrow 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.
- \rightarrow If swallowed: Wash out mouth with water, drink some fresh water. Do not induce vomiting. Seek immediate medical advice.
- \rightarrow In case of inhalation: Remove person to fresh air. For example, move person into another room with open windows or outside.
- \rightarrow In case of doubt, seek medical advice without delay. Take the chemical and its container with you.
- \rightarrow In case of injury always seek medical advice.

- \rightarrow Do not eat or drink in the experimental area.
- \rightarrow Take off all contaminated clothing immediatelv.
- \rightarrow May stain some fabrics. Protect and cover playing area before use.
- \rightarrow Do not leave cosmetics in the sun or in very hot areas.
- \rightarrow Always store this experiment kit in a cool place that is inaccessible for small children.
- \rightarrow If at any time you see mold or discoloration on any of your products or in any of the ingredients, do not use it and put it in the trash immediatelv.
- \rightarrow DISPOSAL ADVICE: Put in household waste. Do not flush down sink.

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.

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Yummy Rainbow Lip Balm Lab

IMPORTANT INFORMATION

Dear Parents and Adults,

Children want to explore, understand, and create new things. They want to try things and do them by themselves. They want to gain knowledge! They can do all of this with Thames & Kosmos experiment kits. With every single experiment, they grow smarter and more knowledgeable.

With this experiment kit, you will be accompanying your child on an introductory exploration of the chemistry of lip balms and lip glosses, as well as the biology of skin. Please support your child in his or her experiments and help him or her with both advice and in physically performing experimental steps when help is needed.

Your child can create his or her own custom lip products from the materials provided. The materials all have good skin compatibility and are thoroughly safety tested. However, as with all cosmetic products, the possibility of an allergic reaction cannot be totally ruled out. Each time your child makes a new lip balm or lip gloss, we recommend conducting a patch test as described on pages 8 and 11. The raw, unmixed ingredients are not intended to be applied to the skin.

Please read and follow these instructions as well as the safety rules, the first aid information, and the ingredient information on the previous pages before starting. This kit is not suitable for children under 8 years and is intended for use under adult supervision. Keep this kit out of reach of children under 8 years old. Discuss the warnings, safety information and the possible hazards with the child or children before commencing the activities. Only carry out those activities which are listed in the instructions. Devote special care to information about the safe handling of hot liquids. Keep the lids on the containers when they are not in use.

A dedicated "laboratory" room will not be necessary for these simple experiments. A sturdy table with a washable, heat-resistant surface is good enough. It should be well lit and ventilated, equipped with a nearby water tap, and not too close to any stored foods. The surroundings should be free of all obstacles. Always get the required materials ready before beginning an experiment. Your child should wear old clothes (or an old smock). After completing the experiments, he or she should pick up and clean the work area and thoroughly wash his or her hands. Put any waste in the household trash.

It is recommended that the finished lip balms and lip glosses be used in four weeks. Please dispose of them after four weeks.

We hope you and your child have a lot of fun with experimenting and creating lip balms and lip glosses!



Explore the **Science** of lip care!

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Mix up a rainbow of mouth-wateringly delicious lip balms and lip glosses. Experiment with a vibrant spectrum of colors and flavors to create your own personalized lip products. What color and flavor combinations will you create?

Setting up your lip balm laboratory

You will need

- Laboratory station
- All kit contents

Here's how

 Choose a clean, uncluttered work area in which to set up your laboratory station. The area should be well lit and ventilated, close to a water supply, and away from food. Choose a stable, stain-resistant work surface.

- 2. Cover the work surface in old newspaper or paper towels to protect it from spills.
- Place the laboratory station on the covered surface and load all of the tools and materials into their designated compartments, as shown in the diagram below.
- 4. Decorate your station, tools, and containers with the stickers from the sticker sheet.



EXPERIMENT 2

Mixing your first lip balm

Start by learning how to blend the ingredients into a lip balm.

You will need

- All kit contents

- Water
- Microwave
- Oven mitt or potholder

Here's how

- Remove the lid from the jar of petroleum jelly. Use a spatula to scoop the petroleum jelly out of the jar and into the large spoon. Gather one level spoonful of petroleum jelly in the spoon.
- 2. Use the spatula to scrape the petroleum jelly out of the spoon and into the bottom of the small measuring cup.
- 3. Rest the sticky spoon on the petroleum jelly jar as shown when you are not using it to prevent the petroleum jelly from getting on other things.
- Open the bag of berry wax pellets. Add one small spoonful of the pellets to the beaker. That is about 12 pellets. Then remove the lid from the baby oil bottle and add 12 drops of baby oil to the cup.

Note: If you live in a hot climate, use 14 wax pellets and ten drops of baby oil, so the final lip balm is not too liquid.

5. Stir the mixture with the spatula so that it sticks around the sides of the measuring cup up to about the 10-ml mark. This helps it to melt faster later.



- 6. Put 35 ml of cold water into the large measuring cup.
- Microwave the cup of water for up to 45 seconds. Do not microwave the wax-oil mixture! If the water comes to a boil in the microwave, stop the microwave and let the cup sit for 30 seconds before moving it.

CAUTION! Hot water can cause burns. An adult must help you heat the water in the microwave and carry the hot water to your work area. Use oven mitts or potholders.

Note: You can use water heated on the stove in a kettle or pot, but let it sit for 30 seconds after it boils before pouring it into the measuring cup.

- 8. Remove the large cup from the microwave. Place it on a heat-resistant surface. Place the small measuring cup containing the wax-oil mixture into the large measuring cup, as shown. Do not let any water get into the mixture, as that will ruin the lip balm. Let it sit for two minutes. The wax-oil mixture will melt.
- Carefully lift the small cup out of the large cup. Add cosmetic dyes according to the formulas on page 12. For your first lip balm, use only one of the first six formulas on page 12. These are formulas for light colors that use a maximum of five drops of dye.

Later, if you want to try one of the other formulas on page 12, make sure you pay attention to the amount of baby oil in the formula, which in some cases has been reduced from this basic recipe to compensate for an increase in dye. Do not add more dye than the amounts specified on page 12.



- 10. Add flavors according to the formulas on page 13. Do not add more flavor than the amounts specified on page 13, which is a maximum of three drops.
- Stir the mixture until it is a smooth and consistent texture, and none of the solid wax pellets remain.

Note: If the mixture cools down too much and becomes too hard to blend, put the small cup back into the hot water in the large cup for a couple minutes to soften it again.

- 12. Pour the lip balm mixture into a clean lip balm jar. Use the spatula to scrape it out of the cup and into the jar if it has cooled too much to pour. Let it cool and solidify completely before use. It is recommended that the lip balm is used within four weeks. After four weeks, you must discard it. Write the expiration date on each jar.
- 13. Always patch test your lip balms before use. To conduct a patch test, dab a small amount of the lip balm onto your finger. Then apply a thin smear to your inner wrist. Wait five minutes. Wipe off the lip balm and wash the area with soapy water. If there is no irritation or discoloration, it is fine to use. (For a more thorough test, put the lip balm on an adhesive bandage and stick it to your wrist overnight. Use bandages that you know you are not allergic to.)
- 14. Your lip balm is ready to use! Apply it to your lips with clean fingers and wash your hands afterward. Do not allow it to get on clothing or other items that can be stained.

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EXPERIMENTS 3-7

Creating a rainbow of lip balms

Now that you know how to make the lip balm, you can make up to five more lip balms in different colors and flavors.

You will need

- All kit contents

 All additionally required materials from experiment 1

Here's how

 Repeat experiment 2 to make lip balms in other colors and flavors. Follow the formulas on pages 12 and 13, or design your own! Give each lip balm a name and record its formula in the table below.



Some notes about making custom lip balms:

- All of the dyes and flavors are bottled in a special cosmetic oil. Therefore, if you use more drops of dyes or flavors, reduce the amount of baby oil by the same number of drops.
- For softer lip balm, use more oil and less wax.
- For harder lip balm, use more wax and less oil.
- To keep the lip balm solid on very hot days, reduce the amount of oil or increase the amount of wax.
- Do not add too much dye or flavor. Do not exceed the amounts specified on pages 12 and 13.



EXPERIMENTS 8-9

Making a lovely lip gloss

While lip balm is a waxy, thick substance intended to moisturize the lips, lip gloss is a more fluid substance intended to add shine and color to the lips.

You will need

– All kit contents

Here's how

- Starting with clean equipment, remove the lid and roll-on applicator from the lip gloss bottle if necessary. Fill the bottle with 7 ml of baby oil, which you can measure with the measuring cup, or just estimate.
- 2. Add up to seven drops of cosmetic dye according to the formulas on page 13 or according to your own formula.
- 3. Add up to three drops of flavor according to the formulas on page 13 or according to your own formula.
- 4. Carefully insert the roll-on applicator into the bottle, and then put the lid on the bottle.







- 5. Holding the closed bottle as shown, shake it up and down vigorously until it is completely mixed and the color is even throughout.
- 6. Always patch test your lip glosses before use. To conduct a patch test, roll a small amount of the lip gloss onto your inner wrist. Wait five minutes. Wipe off the lip gloss and wash the area with soapy water. If there is no irritation or discoloration, it is fine to use. (For a more thorough test, put the lip gloss on an adhesive bandage and stick it to your wrist overnight. Use bandages that you know you are not allergic to.)
- 7. Your lip gloss is ready to use! Apply it to your lips directly with the roll-on applicator. Always put the lid on after use.

It is recommended that the lip gloss is used within four weeks. After four weeks, you must discard it. Write the expiration date on each bottle.

Do not allow the lip gloss to get on clothing or other items that can be stained.

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8. Repeat these steps to make a second lip gloss. Record your lip gloss formulas below.

Lip Gloss Name

2



Lip balm formulas

Follow these recipes to make lip balms in the colors of your choosing, adding flavor according to the flavor formulas on the next page.

		R TREEM	17384808	BABY QL	400		
Lip	Balm Colors	Petroleum jelly spoons	Wax pellets	Baby oil drops	Red dye drops	Yellow dye drops	Blue dye drops
	Light Red	1	12	12	5	0	0
	Light Orange	1	12	12	3	2	0
	Light Yellow	1	12	12	0	5	0
	Light Green	1	12	12	0	4	1
	Light Blue	1	12	12	0	0	3
	Light Purple	1	12	12	4	0	1
	Note: For the formulas below, pay attention to the amount of baby oil, which has been reduced in some cases to compensate for an increase in dye.						
	Saturated Red	1	12	7	10	0	0
	Saturated Orange	1	12	7	6	4	0
	Saturated Yellow	1	12	7	0	10	0
	Saturated Green	1	12	7	0	8	2
	Saturated Blue	1	12	11	0	0	6
	Saturated Purple	1	12	6	8	0	3
	Magenta	1	12	10	6	0	1
	Plum	1	12	6	7	2	2
	Berry	1	12	8	6	2	1
	Brick	1	12	2	8	5	2
	Peach	1	12	12	2	1	0
	Crimson	1	12	7	8	1	1
	Raisin	1	12	3	7	3	4

+ 2-3 drops of flavor (see flavor formulas on next page)

Lip gloss formulas

Follow these recipes to make lip glosses in the colors of your choosing, adding flavor according to the flavor formulas below.

Lip Gloss Colors	Baby oil	Red dye	Yellow dye	Blue dye drops
Glossy Red	7 ml	3	0	0
Glossy Orange	7 ml	2	4	0
Glossy Yellow	7 ml	0	5	0
Glossy Green	7 ml	0	6	1
Glossy Blue	7 ml	0	0	3
Glossy Purple	7 ml	2	0	1

+ 2-3 drops of flavor (see flavor formulas below)

Flavor formulas

Lip Balm and Lip Gloss Flavors	Strawberry flavor drops	Banana flavor drops	Grape flavor drops
Strawberry	2	0	0
Banana	0	2	0
Grape	0	0	2
Strawberry-Banana	1	1	0
Strawberry-Grape	1	0	1
Banana-Grape	0	1	1
Fruity Explosion	1	1	1

How does lip balm work?

Conduct this experiment to see for yourself how lip balm works.

You will need

- A finished lip balm
- Measuring cup
- Sheet of white paper
- Water

Here's how

- 1. Smear lip balm on one side of a sheet of paper with your finger.
- 2. Fill the measuring cup with water. Wet your finger in the water and smear water on both sides of the paper. Smear water over the lip balm and smear water directly onto the paper. Wash your hand and observe what happens.

WHAT'S HAPPENINS ?

Paper is a little like the outer layer of our skin, in that it absorbs water and it loses water. On hot, windy, and cold dry days, water evaporates from our skin into the air. Lip balm puts a protective, waterproof layer on skin to keep moisture from evaporating from the skin. In this experiment, you can see how lip balm is waterproof. On the side of the paper without the lip balm, the water soaks right into the paper and the paper turns darker there. On the side of the paper with the lip balm, the water beads up on top of the lip balm. This is because the lip balm is made of oil and wax, which are **hydrophobic**, or "water fearing." The water sticks to itself in little beads instead of sticking to the wax-oil lip balm, or mixing with it.





Oil and Water Don't Mix

Water 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 much larger than the hydrogen atom, and pulls the negative electrons toward itself. This influences the way that water interacts with other molecules.

Unlike water, oils and waxes are **nonpolar**. 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.



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CHECK IT OUT

KEYWORDS Lip Balm

Lip balm, or lip salve, is a waxy substance that is applied to the lips to moisturize, protect, and relieve chapped, dry, or damaged lips. It usually contains wax, like beeswax, carnauba wax, or paraffin, and often contains other ingredients including dyes, flavors, fragrances, and sunscreen.

Lip Gloss

Lip gloss is a cosmetic that is mainly used to make lips appear glossy and lustrous. It is usually an oil-based liquid applied with a roller or brush. It often contains dyes, flavors, glitter, or shimmer.

THE HYDROPHOBIC EFFECT

The tendency of a nonpolar substance to separate out of a polar substance, which you observed in experiment 10, is known as the **hydrophobic effect**. This phenomena is critical for the function of cells, and thus life itself! 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. In experiment 10, 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.



BERRY WAX

Berry wax, or Japan wax, is a water-insoluble wax derived from the **berries of the Japanese** wax tree and the lacquer tree,

Japanese wax tree berries

which are species of sumac trees that grow in Asia. The wax is mild and non-allergenic, so it is often used in cosmetics, as well as candles, soaps, and art supplies.

PETROLEUM JELLY

Petroleum jelly is a thick, oily substance made from **hydrocarbons**, which are organic compounds made of hydrogen and carbon atoms. It is used to soften the hard wax in the lip balm formula, making it easier to apply to the lips.

SHIMMER

Mica

Another material often found in lip products is **shimmer.** This fine powder is made from crushed **mica**, which is a naturally occurring mineral. Mica is flaky and shiny. It forms in thin, transparent sheets that can be peeled apart. It has been used for millennia as a natural glitter, to add sparkle to cosmetics, and in the place of glass for transparent windows.

The Composition of the Skin

Human skin is made of two main layers: the **epidermis** (A) and the **dermis** (B). Below the dermis is the **subcutaneous tissue** (C), which is not officially part of the skin. It attaches the skin to the bones and muscles and contains a lot of fat cells, which pad and insulate the body.

The epidermis is the outermost layer, the surface of which is visible. It is a protective barrier that keeps water in the body and poisons out. It is only about 0.5 to 4 mm thick, but it is subdivided into five layers. Right at the surface is a rough outer layer called the **stratum corneum.** It consists of dead or dying cells that are adhered together. Dead cells are constantly being rejected by the body and are continuously replaced by new cells from 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.

The dermis is made of stretchy connective tissue and contains hair follicles, sweat glands, blood vessels, and nerves.

THE THREE-LAYER MODEL

10

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.

Key to diagram above:

- 1. Stratum corneum
- 2. Stratum basale or
- germinativum
- 3. Hair 4. Hair follicle

R

- 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

Lips are super sensitive!

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.

The Oldest Lip Balm

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.

ALL 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!

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. 2nd Edition 2021, 2022 Thames & Kosmos, LLC, Providence, RI, USA Thames & Kosmos® is a registered trademark of Thames & Kosmos, LLC.

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