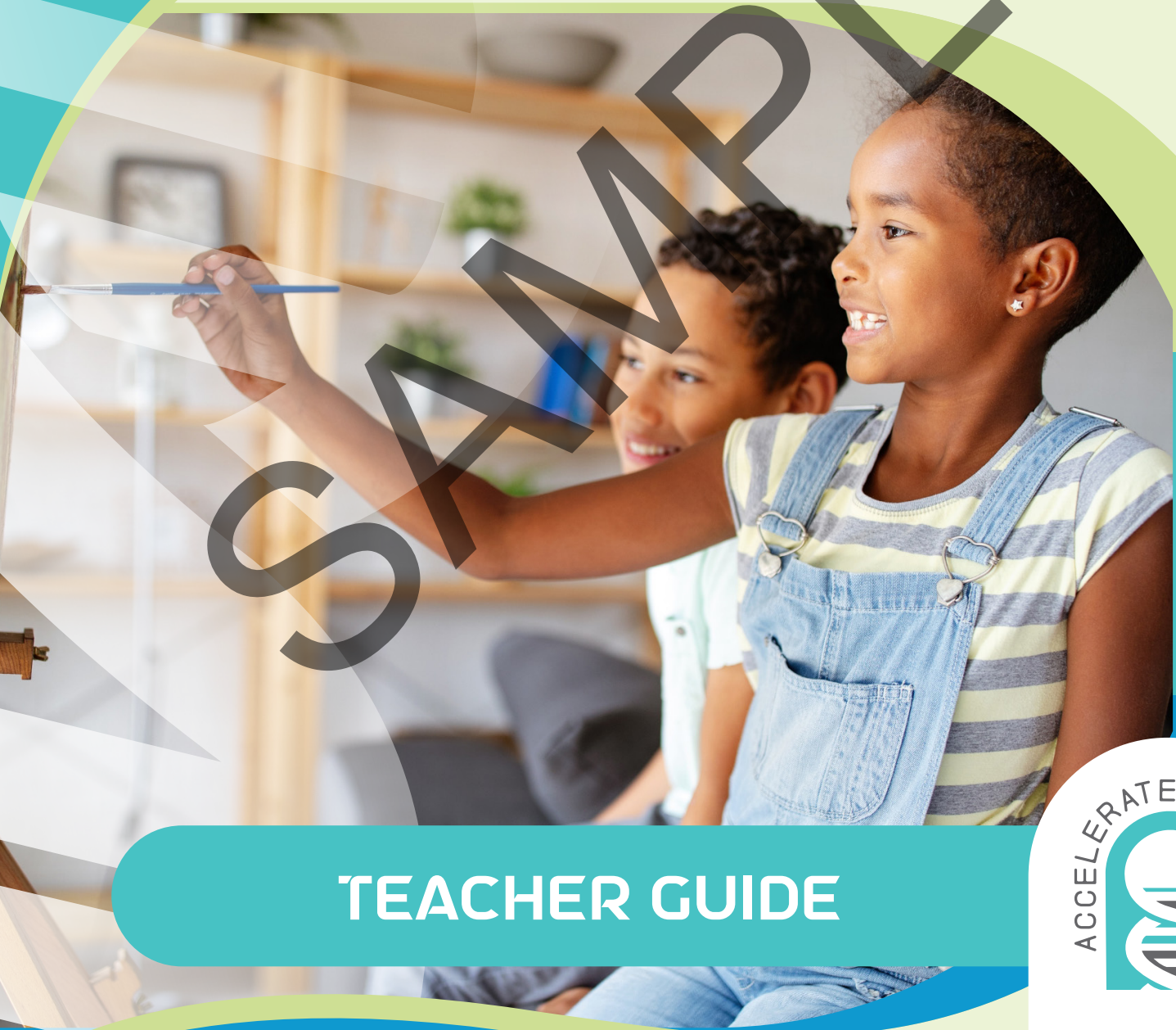


THE LIGHT TRAP

SAMPLE



TEACHER GUIDE



PLANNING

Here's a suggested schedule for this kit! the activities should be completed in order, but you can choose when the lessons take place over time. The time required for each lesson may vary.

ACTIVITY INFORMATION	SECTION(S)	TIME	DAY/LESSON
ACTIVITY 1: PAINTING IT BLACK Paint with the world's blackest paint. Total time: 30 min	<ul style="list-style-type: none"> The Power of Paint 	30 minutes	Day 1
ACTIVITY 2: (ALMOST) A PORTABLE BLACK HOLE Learn about Vantablack® Total time: 2 h 30 min	<ul style="list-style-type: none"> So Dark, It Doesn't Seem Real! 	30 minutes	Day 2
	<ul style="list-style-type: none"> Vantablack® (through "Science Meets Art") 	30 minutes	Day 3
	<ul style="list-style-type: none"> Reminder: Paint the 2nd Coat 	30 minutes	Day 4
	<ul style="list-style-type: none"> Vantablack® (through end) 	60 minutes	Day 5
ACTIVITY 3: TRAPPING LIGHT Experiment with albedo. Total time: 1 h 30 min	<ul style="list-style-type: none"> Shadow and Light 	30 minutes	Day 6
	<ul style="list-style-type: none"> Trap or Release 	30 minutes	Day 7
	<ul style="list-style-type: none"> Reflecting Light 	30 minutes	Day 8
ACTIVITY 4: PUTTING THE PAINT TO THE TEST Test the paint to see if you can make objects disappear. Total time: 1 h	<ul style="list-style-type: none"> Making Objects Disappear (Part 1) 	30 minutes	Day 9
	<ul style="list-style-type: none"> Making Objects Disappear (Part 2) 	30 minutes	Day 10
ACTIVITY 5: ANALYZING PIGMENT Develop a chromatography experiment with paint and ink. Total time: 1 h 30 min	<ul style="list-style-type: none"> Materials are Made of Molecules 	30 minutes	Day 11
	<ul style="list-style-type: none"> Pigment Crawl (set up and first 3 observations) 	30 minutes	Day 12
	<ul style="list-style-type: none"> Pigment Crawl (final observation) 	30 minutes	Day 13
ACTIVITY 6: LEARN MORE! Use any or all of these fun extensions to keep the learning going. Total time: 2+ h	<ul style="list-style-type: none"> Singularity Black 	30 minutes	Day 14
	<ul style="list-style-type: none"> Making More Disappear 	45 minutes	Day 15
	<ul style="list-style-type: none"> Creativity with Coatings 	30 minutes	Day 16
	<ul style="list-style-type: none"> Albedo Experiment 	30 minutes	Day 17
	<ul style="list-style-type: none"> Creating Pigments 	30 minutes	Day 18

Total time: 9+ hours

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activity

ANALYZING BLACK PIGMENT

Students will learn about types of matter and how the materials a pigment is made of impact the pigmentation. To do so, students will perform a chromatography experiment, watching pigments of colors separate on filter paper.

LEARNING GOALS:

- ✓ I can develop a model to explain that matter is made of tiny particles.

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MATERIALS ARE MADE OF MOLECULES

CONTENT

- Molecule and mixture are defined.
- Your student may notice that in the glass example in the pop-out section, the molecules of glass are actually the same as the molecules in quartz. This is an example of how the arrangement of the molecules, rather than the types of the molecules, is the reason for the difference in characteristics.
- The molecular model of matter is a foundational concept that will reappear time and time again in future chemistry and physics instruction. Encourage your student to practice talking about matter at both the macroscopic and microscopic levels.
- Filter chromatography is a classic science activity, and in this situation, it will help your student see that the marker and super-black paint are different mixtures with different molecules. These differences affect their characteristics.

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PREPARATION AND SUPERVISION

WARNING:



Chemical Warning: This kit contains chemicals that may be harmful if misused. Read cautions on individual containers carefully. Not to be used by children except under adult supervision.

Choking Hazard: Small parts. Not for your children under 3 years.

- You should see the marker separate easily into its separate colors, showing that it is really made of multiple colors that, when combined, appear black. The super-black paint, on the other hand, usually will stay in one place on the paper, except for one reddish band that moves up the paper. This indicates that the paint is not made of a combination of colors like the marker is. In fact, it is more likely that it contains some sort of carbon substance such as charcoal or graphite. The paint manufacturer's specific recipe is not available to the public, so we cannot provide a definitive answer here, but your student should notice that the marker and paint have different components based on the differences observed in chromatography.



THINK ABOUT IT!

- ❓ **Question 1: Think about how the two pigment types (marker and super-black paint) behaved during chromatography. What was the same? What was different?**

Answer: The most likely response here is that the two types both stayed on the paper for the most part, but more of the marker's dot moved up the paper than the super-black paint, which only had a small portion of it move up. Of course, your results may vary somewhat.

- ❓ **Question 2: If two pigments have similar light-absorbing ability, would you expect them to behave like each other during chromatography? Why or why not?**

Answer: Answers may vary.

How to Help: *Accept responses that are well-supported with reasoning. For example, your student might say they would behave similarly because they would be made of similar molecules, or they might say they could be different because there are many types of molecules that can make a material absorb light.*

EXTENSIONS

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There are five ideas included in the Student Workbook that can extend the learning experience. You can let your student decide which ones to pursue, or you can recommend options based on your available time and materials. We have tried to offer opportunities for several types of learning styles and preferences, as well as ways to get more use out of the kit materials.

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SINGULARITY BLACK

RESEARCH

- You can assist your student by helping them notice similarities and differences among the two paint types. Once they have completed their poster, encourage them to decide which paint they think is better.

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MAKING MORE DISAPPEAR

HANDS-ON

- Make sure to have your student use an easily cleanable surface if they choose to do this activity.
- Encourage them to use two coats as they did during Activity 1.

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CREATIVITY WITH COATINGS

HANDS-ON

- If you live in an area that has fall leaves, encourage your student to collect leaves of different colors to use for this extension activity. They can also compare the fall leaves to similar pigments from other materials, such as markers.

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ALBEDO EXPERIMENT

HANDS-ON

- Assist your student by encouraging them to think of surfaces they think are similar and different. Do the predictions they make about surface similarity match up with their results?

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CREATING PIGMENTS

HANDS-ON

- Encourage your student's creativity in looking for items with unknown pigments that they can discover. Have students make a prediction for what color pigments will be visible from various substances. Then, they can create a conclusion based on their results.

GLOSSARY

Albedo - the ability of a surface to reflect light, rather than absorbing it and changing it to heat.

Coating - a material that sticks to and covers a surface.

Mixture - a type of matter that can be separated physically.

Molecules - the smallest pieces of matter.

Pigments - substances that give materials color.

Surface reflectance - the amount of light that reflects off of a surface.

Synthetic - a type of material that is made from chemicals in a laboratory.

SAMPLE

SAMPLE

ACCELERATE



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Kit	SU-LITRAP
Instructions	IN-LITRAPT
Revision Date	6/2023