



# Color and Heat

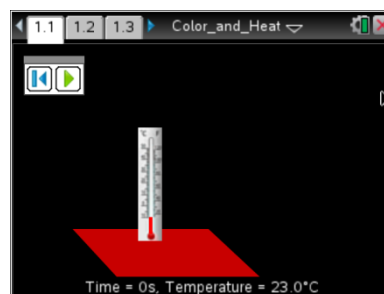
## Student Activity

Name \_\_\_\_\_

Class \_\_\_\_\_

Open the TI-Nspire document *Color\_and\_Heat.tns*.

In this investigation, you will explore different colored plates that are being heated as they absorb and reflect the electromagnetic radiation from light. As time passes in the simulation, temperature data will be collected, displayed, and graphed. You will vary the color of the plate and observe the differences in the absorption and reflection of primary and secondary colors, as well as white, black and gray.



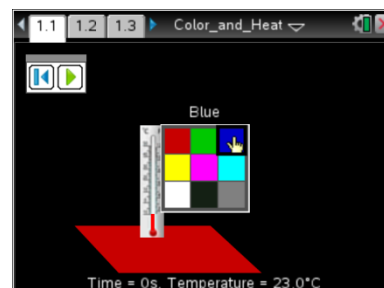
As you explore the temperature of the different colored plates over time, you will begin to see patterns in the relationship between temperature and color, as it relates to the absorption and reflection of light. Primary and secondary colors are related and as you explore this simulation, you will use the data to determine the connections between them.

### Part 1: Exploring the System

1. Read the directions explaining how to use the simulation. Click to close the pop-up box when you are finished. Press if you need to view the directions again.



2. Click on the color plate and select a color to use. Start the simulation by pressing the Play button . Observe the time and temperature displayed at the bottom of the page. Also, note the colors that are being absorbed and reflected, which are represented by colored lines coming in and going out from the plate. Then, look at page 1.2 for a data table and page 1.3 for a graph of the data.



To pause the simulation, press . To reset, press .

- Q1. For the color you selected, what happens in the simulation? Write a description and share this with a neighbor and the class as requested.

3. Test the simulation for all of the colors. Note any patterns or relationships between the temperatures and the color of light that is absorbed and reflected.



# Color and Heat

## Student Activity

Name \_\_\_\_\_  
Class \_\_\_\_\_

Q2. Rank the colors from hottest to coolest based on what you saw in the simulation.

<u>Rank</u>	<u>Color</u>	<u>Reflected Colors</u>
1 <sup>st</sup> (Hottest)		
2 <sup>nd</sup>		
3 <sup>rd</sup>		
4 <sup>th</sup>		
5 <sup>th</sup>		
6 <sup>th</sup>		
7 <sup>th</sup>		
8 <sup>th</sup>		
9 <sup>th</sup> (Coolest)		

4. Compare your rankings with others in the class.

Q3. Describe a situation in which you would pick a color based on what you have learned about how different colors absorb light and heat up. Include the color you would pick and why.

### Part 2: A Closer Look

Move to pages 1.2 – 1.3.

5. Now you need to quantify the way each color heats over time.  
Looking at the spreadsheet on page 1.2 and the graph on page 1.3, answer questions 4 and 5.

A	time	B	temp	C		D	
1	0		23				
2	1		25.2491				
3	2		27.4581				
4	3		29.6276				
5	4		31.7584				
6	5		32.8511				
A1	=0						

Q4. Which colors heat the fastest? Why?

Q5. Which colors heat the slowest? Why?

6. Now you will be assigned a time at which you will collect the temperature for each of the nine colored plates. Record your assigned time below.

My assigned time \_\_\_\_\_



**Move to page 1.4.**

Q6. Fill in the temperature readings for your assigned time in the data table below. Add this data to the spreadsheet on page 1.4 as well. Next, rank these colors with 1 being the hottest and 9 being the coolest.

	Red	Green	Blue	Yellow	Magenta	Cyan	White	Black	Gray
Temp									
Rank									

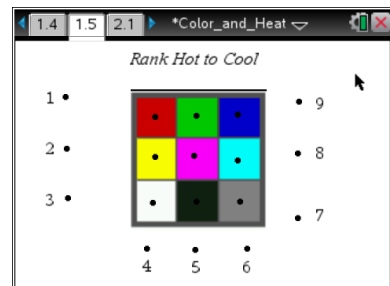
Q7. How well does this new ranking match with others in the class? Compare your data with at least one other student that had the same time as yours. Also, compare with others that had larger or smaller assigned times.

Q8. How well does this new ranking match with what you stated in question 2 from Part 1?

**Move to page 1.5.**

7. After comparing your results, make any adjustments to your rankings. You may now connect the dots to display your rankings.

Q9. Connect the rank with the color. To do this, use the Segment tool.  
Select **Menu>4:Points & Lines>5:Segment**.



Click on the point next to the rank and then draw the segment to the point in the center of the color.

Note: Press **ctrl** **Z** to undo and press **ctrl** **Y** to redo.

Q10. Given what you have learned, assume that you are in the Arctic and you can bring two blankets. Which two colors would you select and why?

Q11. Your aunt has invited you to spend the summer in the Sahara Desert with her. She said that she would buy two sand buggies to play with and wants to know what colors you want. Pick two colors and explain your rationale for choosing those colors.



Q12. Given what you now know about the heating capacity of these colors, give a situation during which you would pick cyan over yellow. Explain your reasoning.

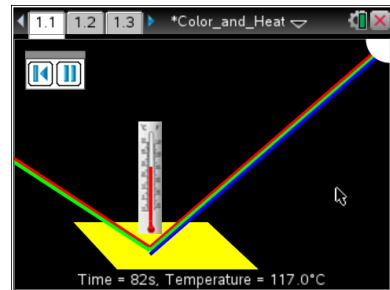
### Part 3: Primary vs. Secondary Colors

8. Now you will explore the relationship between the primary and secondary colors.

Q13. Of the six given colors on page 1.1, list the primary colors.

Q14. Of the six given colors on page 1.1, list the secondary colors.

Q15. Return to page 1.1 and set the color to one of the secondary colors. What colors do you see being reflected? Repeat this for all three secondary colors.



### Move to page 2.1.

9. Now test what you have learned using the colors on page 2.1. Grab the open circle in the center of the square to select a color and move it over another.

Q16. What do you notice about the resulting color when you overlap two colors?

