INVESTIGATE & EXPERIMENT

Colour and Heat

Heat Absorption

Have you ever walked barefoot on a hot summer's day and noticed the black asphalt burns your feet while the white concrete stays cooler? That's because colours don't just look different, they react to light and heat differently too!

When light from the sun or a lamp hits an object, some of that light is absorbed and turned into heat. The more light an object absorbs, the hotter it gets.

This science is used in real life all the time. Like choosing colours for summer clothes, designing cool roofs for homes, or making cars more energy efficient.

So, if we want to know more about energy, sustainability, and even smart design, it's important to understand which colour absorbs the most light.

The Challenge

In this STEM project, you will explore the science behind how light energy transforms into heat energy and answer the question:

Which colour absorbs the most light energy?

1. Research

It's time to conduct your own research. Where are the gaps in what you know? Is there anything you don't understand or want to learn more about? Speak to your teacher and use books, websites, or videos to explore more of the science behind how heat and light interact with materials. Here is some information to get you started:

What is heat energy?

Heat energy, also known as **thermal energy**, comes from the movement of particles in a substance. The faster they move, the hotter the substance becomes.

How does heat transfer happen?

Heat can be transferred through:

Conduction which is touch
Convection which is movement
Radiation which is waves of energy from the sun or other sources

What does colour have to do with it?

Light is a type of radiation that carries energy. When light hits a surface, some of it is reflected and some is absorbed and turned to heat. Different colours absorb different amounts of light. So depending on the colour, a surface might warm up faster or slower. But which colours do what? That's what your experiment will uncover.

2. Write a Hypothesis

Now you know more about light and heat, it's time to form your hypothesis. This is your idea that explains what you think will happen and why.

I think the colour _____ will get the hottest

because _____ .

3. Variables

Variables are parts of an experiment that can change. To conduct a fair experiment, it's important to identify the variables!

Independent variable: This is the one variable that will change between each test. In this experiment you are testing how different colours absorb energy, so the independent variable is colour.

Dependent Variable: This is the variable you will measure in each test. In this experiment you are measuring the temperature of water in degrees Celsius.

Controlled Variables: The controlled variables are all the other things we need to keep the same between experiments, to make sure every test is fair.

You can use a table like the one below to write down your variables as you prepare for your investigation:

What will I keep the same?	What will I change?	What will I measure?
Controlled variables	**Independent variable**	**Dependent variable**

Adapted from: Hackling, MW 2005, *Working Scientifically: Implementing and Assessing Open Investigation Work in Science*, Department of Education and Training, Western Australia.

4. Materials Required

- Paper or cardboard in different colours (e.g. black, white, red, blue, yellow)
- Heat source (e.g. lamp with incandescent bulb or access to direct sunlight)
- Thermometer
- Stopwatch or timer
- Ruler

Safety Tips:
- Do not touch hot bulbs.
- Do not look directly at bright lights.
- Work with adult supervision when using electrical equipment.

5. Method

1. Place the different coloured materials side by side, flat under the same light source.
2. Insert a thermometer under or onto each colour (make sure the setup is identical for each one).
3. Turn on the light and start your timer.
4. Record the starting temperature and measure again after 5, 10, and 15 minutes.
5. Repeat the experiment to check for consistent results.

6. Plan Your Test

Now you know your materials and method, draw a labelled diagram of your setup. How will you make sure the light is hitting each material the same way? Use labels to show your lamp, coloured surfaces, thermometers, and distances.

7. Conduct Your Investigation

It's time to start your experiment! Remember to follow the method carefully and use your equipment safely.

Take photos and videos as proof of your work, which can form part of the final presentation and STEM Expo!

8. Record Your Results

Create your own method of recording results or use the table below:

Colour	Starting Temp (C°)	Temp after 5 min (C°)	Temp after 10 min (C°)	Temp after 15 (C°)
Red				
Yellow				
Blue				
Etc...				

TIP: Create a graph showing temperature change over time.

9. Analyse Your Results

It's time to look at your results and think about what they show. Analysing your results helps you understand what happened in your experiment and why. It shows us whether our hypothesis was correct and helps us identify patterns, errors, or unexpected outcomes. As part of your analysis write answers for the following questions:

- **Which colour absorbed the most heat?**
- **Did your results support your hypothesis?**
- **What might explain the differences in temperature between colours?**
- **Did anything unexpected happen?**
- **How could you improve your method next time?**

Extension

Want to take your experiment further? Once you've completed your main investigation, you can design your own twist!

Here are some ideas to inspire you:

- Test how shiny or matte finishes affect heat absorption.
- Try using materials like fabric, metal, or plastic.
- Explore how colour affects heat in cold and warm weather.
- Apply your learning and design a cooler school uniform or a better energy-saving home.

10. STEM Expo

It's time to communicate your findings at the STEM Expo! Can you come up with a creative way to present your process and discoveries through a report, poster, or even a video? Make sure you include:

- Your question and hypothesis
- Your method and results
- Your conclusion and explanation
- Any new questions that arose from your findings

11. Showcase @ rezourceforce.com.au

Now you can share your project with the REZource Force Online Showcase. This is your chance to show your work to other schools, community members, and professionals working in the renewable energy industry.

Selected entries will be eligible to win prizes for their school!

To enter, use the QR code to fill out a short form and upload photos, videos, or documents that show what you created and discovered.

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