Color and Heat Absorption Inquiry

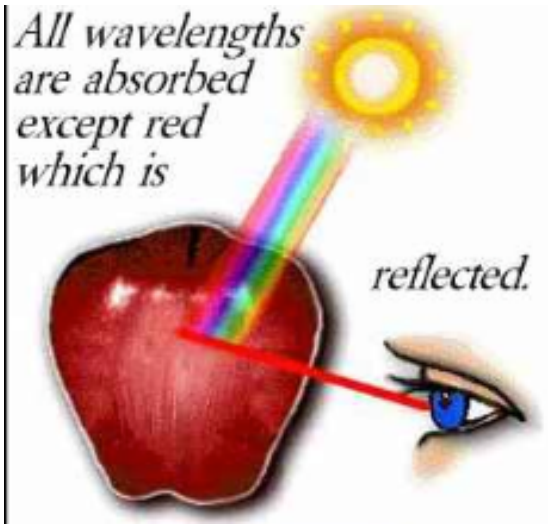
Directions: Write the purpose to the inquiry down. Read the background information. Then answer any questions in the procedures; remember to include part of the question into your answer.

Purpose: Which color car would be the best to rent in winter in Minnesota to save you the most money on gas?

Background Information

It is a known fact that all objects gives off energy. At the same time, all objects take in energy, too. The color of an object affects what colors of light the object gives off (reflects) and what it absorbs (soak in).

The color of an object relies on the wavelengths of colors reflected from the object. A red apple has a red color because the red wavelengths in white light are reflected and other wavelengths are absorbed. But if a red apple were to be lit by light that had no red wavelengths, the apple would appear almost black.



The reason material looks dark is it absorbs most of the light that hits it. On the other hand, a material that cannot absorb radiation will reflect it to your eyes, making the material look like the color of the light and giving it a lighter hue. Therefore, if a surface absorbs most of the light hitting it, the surface heats up quickly.

Black or dark colored materials and objects radiate (give off) and absorb heat the fastest. The reason for this is that lighter colors reflect more light. Instead of thinking of dark colors as absorbers of heat, darker colors are actually better absorbers of light. Darker colors absorb more light. Since light is energy, absorption would increase a material's temperature. This means that, darker colors become better radiators of heat.

It is important to note that an object appears white if it reflects all colors and black if it absorbs all colors. Naturally there are different degrees of color and therefore degrees of absorption.

When a black object is lit by white light, all wavelengths are absorbed and none are reflected. As a result, the object appears black when we look at it. When a black object absorbs light, the energy carried by the light doesn't just disappear, it raises the energy of the object that absorbs the light.

This transformation of light into heat is the key to understanding the whole process because it accounts for the law of conservation of energy. Light just doesn't disappear when it strikes a black object. It is transformed into another kind of radiation that is either give off or absorbed within the black object, therefore, the darker the object, the better its release of heat because it absorbs light better.

The bottom line is the reason dark colors are dark is that they absorb light instead of reflecting it. Since light is energy, absorbing light makes dark colors hotter.

Hypothesis: Based on your knowledge of reflection, absorption, and wavelength put the colors of the rainbow (red, orange, yellow, green, blue, violet) in order from the one that absorbs the MOST light to the one that absorbs the LEAST light.

Hypothesis	Actual Answer
Most	Most
Least	Least

Scenario:
Which color car would be the best to rent in winter in Minnesota to save you the most money on gas?

Questions to be answered:

1. Complete the data table filling in starting temperature average, ending temperature average.
2. Find the difference by taking the ending average for each color and subtracting the starting average temperature.
3. (A.) Which color would keep the inside of your car the coldest requiring you to use more gas to heat up your car to stay warm?
   (B.) Back up your answer with evidence (data).
   (C.) Explain how absorption affected your answer.
   (D.) Explain how reflection affected your answer.
4. 4. (A.) Which color would keep the inside of your car the warmest requiring you to use less gas to heat up your car to stay warm?
   (B.) Back up your answer with evidence (data).
   (C.) Explain how absorption affected your answer.
   (D.) Explain how reflection affected your answer.

Data Table:

Heat Absorption of Automobiles									
Color	**Starting Temperature**				**Ending Temperature**				**Difference**
Trials	1	2	3	A	1	2	3	A	Ending – Starting Average
Red	28	32	30		58	62	60		
Yellow	27	30	33		30	38	34		
Violet	26	34	30		43	47	45		
Green	33	30	27		40	58	49		
Orange	30	29	31		38	44	41		
Blue	32	30	28		58	52	55		

5. Complete the graphic organizer to answer the question, “what happens when light strikes the surface?”

Graphic Organizer

Directions: All answer must be in complete sentences.

Claim: Answer the purpose question.

Explain the role of absorption in your claim.

Explain the role of reflection in your claim.

Which color would cost you the most money? (Counter claim)

Explain the role of absorption to the question above.

Explain the role of reflection to your counter claim.

Concluding Sentence: Restate your claim in a different way.