NAME\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ IS LIGHT A FORM OF ENERGY?

**1**Essentially, the term, **energy,** is defined as: **the ability to create a change.**

So let me pose two questions: **Can light create a change? (Is light, energy?) *and* If light were capable of causing a change, what type of visible light might be the strongest?**

At the surface of it, the question is a no-brainer. Just think about **photosynthesis**. Light helps to **5**combine the carbon atoms of carbon dioxide molecules into molecules of glucose. Most folks take that on faith; faith in the teacher, faith in the author of a text, faith in the editor of the Wikipedia page used to do a biology homework ….yeah, faith. **But can we investigate and *show* that light is an “agent of change” … that light is a form of energy? Today we shall try to do so.**

In today’s work there are two chemical reactions to study. One results from combining two solutions **10**of chemicals to produce a new solid.

**First reaction:** AgNO3 (aq) + NaCl (aq) → AgCl(s) + NaNO3 (aq)

silver nitrate solution sodium chloride solution silver chloride solid sodium nitrate solution

The second reaction will use a strong bright light to attack the AgCl(s) produced in the first reaction. Bright light should be able to convert the AgCl(s) into silver metal and chlorine gas. Essentially, when light is used to initiate a chemical change, the reaction is called a *photochemical reaction*. Such a **15**reaction can happen pretty fast, so silver metal might be formed quickly. When silver is formed quickly, the grains (crystals) of the metal are very small, and act as a **light trap**. Any other light striking the tiny metallic crystals, bounces around like a ball in a pinball machine, and the light is not “reflected” back, making the metal appear to be a gray to black solid.

**Second reaction**: 2 AgCl(s) → 2 Ag(s) + Cl2 (g)

silver chloride solid silver metal chlorine gas

**20**By using colored glass to filter out some types of light we might be able to determine if certain visible wavelengths of light are stronger than others (by how fast or extensively they create changes).

Clear glass will allow all the visible wavelengths of light to pass through.

Blue glass blocks most wavelengths, but lets the blue wavelengths pass through to the paper.

Green glass should block most light, except for green wavelengths. These should strike the chemicals.

**25**Red glass, lets red light through, but blocks the other wavelengths of light.

For instance, were greater changes produced with blue glass then the blue wavelengths would be considered to be more powerful. If you were to see more silver metal under the red glass, then the red wavelengths would be considered to be more powerful.

Materials: 2 strips of filter paper, 1 ceramic tile, 1 pencil, 1 ruler, 1 working bright light on a ring stand, 3 colored transparent slides, in blue, green and red, 1 colorless transparent slide, 2 micropipettes, silver nitrate solution, sodium chloride solution.

Procedure:

1) Put on your goggles. Keep those fingers out of your eyes! You are also,

R C

G B



welcome

2) Place your ceramic tile at the base of your ring stand. On the tile, lay the

2 strips of filter paper. Using your pencil, label the strips of filter paper

along the edges… as in the diagram, with the letters R (for red),

C (for clear)G (for green), B (for blue)

***Stop and analyze***: Do you have the strips of paper, labeled, and resting

on the ceramic tile?

3) Using one of the micropipettes, aspirate (squeeze) the bulb, place it into the solution of silver nitrate

and release the bulb. The solution will be drawn up into the micropipette. Use the micropipette and

moisten the paper, with the solution, covering the filter paper. **Throw out** the pipette in the garbage can.

**Be careful** SILVER NITRATE STAINS!!!! Do not to get the silver nitrate solution on your skin or

clothes. If you do get some on you, rinse immediately and call me over. You are not “in danger”, but

silver nitrate solution can stain clothing, permanently. If you get some on the lab top, wipe it up, please.

Watch out for stray droplets.

4) Repeat the above process, with the ***other*** micropipette and collect an aliquot [Al-EH-KWOT]

(a fluid sample) of the sodium chloride solution. Dispense the sodium chloride solution over the same

area, as the silver nitrate solution. Be sure to overlap the drops.

5) Place the glass slides over the moistened paper, per your labels.

6) Position the light over the samples, so that the rim of the light is about 8 cms above the samples. A ruler

could help. **TURN ON THE LIGHT>**

7) Let the light shine on the samples for at least 5 minutes. You are responsible for recording observations

regarding what happens / what doesn’t happen.

…. What might you want to include in those observations?…How often should they be made? Will they be

descriptions or measurements? … Where will you record them? …..etc….