

Name _____ Date _____

Partners _____

Invisible Light: Lab #10

Objectives: to investigate the properties of infrared light which is a kind of light which we cannot see with our eyes.

Define contrast:

Procedure:

0. Do not open your team's packet yet.

1. Hidden Messages:

A. Predict what color, if any, you will see by looking at a blank piece of paper of different colors through gels of different colors.

		blank white paper	blank red paper	blank black paper
red gel	Predicted			
	Observed			
blue gel	Predicted			
	Observed			

Explain your reasoning for your predictions.

B. Open your packet now. Lay flat on the table the red gel, the blue gel, and the three small pieces of paper with their *blank sides* upward.

Now look through the red gel at the white paper, and record your observation in the table above.

Were you correct in your prediction?

C. Isaac Newton said that white light is _____

Draw a diagram of the light from the ceiling lamps bouncing off the white paper, then hitting the red gel, and finally coming through it into your eye. Label the colors present in each leg of the light's path.

D. Look at the white paper through the blue gel and record your observation in the data table. Were you correct in your prediction?

E. Look at the other combinations and record them.

Were you correct in your predictions?

Draw another diagram of the light coming from the ceiling lamps, bouncing off the red paper, then hitting the red gel, and finally coming through it to your eye. Label the colors present in each leg of the light's path.

Draw yet another diagram of the light coming from the ceiling lamps, bouncing off the black paper, then hitting the red gel, and finally coming through it to your eye. Label the colors present in each leg of the light's path.

F. Colored messages

Turn over the white paper so that you can see the messages written on it with red and blue crayons. Predict which message you will be able to read through each gel.

		Message seen, white paper	Message seen, black paper
red gel	Predicted		
	Observed		
blue gel	Predicted		
	Observed		

Try the red gel with each colored paper with messages.

Explain why the red gel revealed the message it did in either case:

Try the blue gel with each colored paper with messages.

Explain why the blue gel revealed the message it did in either case:

G. Astronomers use gels (called filters) to observe certain features of the sky without being distracted by other features.

Go to this website: www.sofia.usra.edu/Edu/materials/activeAstronomy/crabnebula.html

This image of the Crab Nebula supernova remnant is by Sven Kohle and Till Credner, 1995. This is all that remains of a star which exploded about 950 years ago.

If you wanted to look at the blue center of the nebula without being distracted by the outer edges of the nebula, which gel should you use?

Try it. Was your prediction correct?

Sketch what you see.

Which filter would you use to look at the red outer filaments most clearly?

Try it and sketch what you see.

2. Hidden stars

A. Go to www.sofia.usra.edu/Edu/materials/activeAstronomy/multiband-logo.html

Describe and sketch what you see.

B. Think of similarities and differences between this situation and the situation of you and the gels in part 1.

Astronomers use infrared cameras to better see through clouds of fine dust which absorb visible light and so dim the stars behind them. Examine the photocopy of “Infrared Astronomy: More Than Our Eyes Can See.” Describe the differences between the visible light image and the infrared image of the region around the constellation Orion, the Hunter.

3. Hearing light

This will be done by the whole class together in a dark room.

A. Photocell with small audio speaker.

Shine a flashlight directly on the photocell. What do you hear?

Move your hand back and forth to “chop” the flashlight beam. What do you hear?

Let an electric fan chop the light beam. What do you hear?

As the flashlight is moved further from the photocell, the signal gets _____

B. Flashlight/Photocell/Speaker/Colored filters

Place only a red filter in the chopped flashlight beam. What do you hear?

Place only a green filter in the chopped flashlight beam. What do you hear?

Place both a red filter and a green filter in the chopped flashlight beam. What do you hear?

Explain:

C. A remote control

Aim a remote control at the photocell and press a button. What do you hear?

Try various buttons and describe what you hear.

D. Room lights

Turn on the room lights. What do you hear?

Explain:

4. Communication by light

Tune the small radio to a strong AM or FM station playing music.

Connect the IR LED lamp to the radio's earphone socket. Now the radio is not playing through its own audio speaker, but rather playing what is connected to its earphone socket (the IR LED lamp in this case).

Aim the IR LED lamp at the photocell and listen carefully to the photocell's speaker. What do you hear?

How can you be sure the signal is light?

5. What is SOFIA?