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Mission 6
The Chemical Elements in Stars

Light, Color, and Prisms–Worksheet

Name: _____Date: _____

Draw what you see using two different prisms.

Prism One: Prism Two:

1. Describe the ways in which the two color "prints" are similar and different:

2. Draw what you would expect to see if you did the same thing again with a third prism:

Prism Three:

3. What is your idea about the source of the color? Is it a part of the light from your light source (Sun or light bulb) that the prism just allows us to see, or is the color put there by the prism?

4. What objects that give off white light are very far away from Earth?

5. Do you think these objects would also create a spectrum such as you have observed today? Why or why not?

6. Do you think that it is possible to "put the white light back together"? You can have as many prisms as you like. Jot down your idea for how to accomplish this task and, with your teacher's permission, go ahead and give it a try!

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Remote Controls–Worksheet

Name: _____Date: _____

Locate a remote control device at your home or the home of a neighbor or friend. Examples are remote-controlled cars or other toys, a television, a CD or DVD player, or a VCR. Conduct as many of the experiments with your remote control as you can.

1. What is the name of the device that you are trying to operate with the remote control?

2. Why do you think that the remote control needs batteries?

3. Look at the device that you are trying to operate. Where does it receive the energy that comes from the remote control?

4. Will your remote control operate the device if you aim it:

90° to the side of the device?

180° (the opposite direction from the device)?

5. Will your remote control operate the device if you aim it:

   at the ceiling?
   at the floor?

6. Point the remote control through the following items and note whether or not your device will turn on or off:

a. Your hand:_____
b. A sheet of plain paper: _____
c. A piece of foil: _____
d. A piece of your clothing: _____
e. A piece of glass (aim it through a drinking glass): _____
f. A piece of plastic wrap or plastic bag: _____
g. A telephone book: _____
h. A metal pan from the kitchen: _____
i. The bottom of a rubber-soled shoe: _____

7. Now test your remote control through two items/objects at your house that are not on the list above. State the name of the object and whether or not the electromagnetic energy got through.

8. Try this one! Go into the next room and try to bounce some energy from your remote control off of a piece of glass or a mirror to your device. Could you make this work?

   If this worked, what precisely did you need to do?

9. What conclusions can you make about how your remote control operates? Does it seem to operate through certain types of materials but not others?

10. If your remote worked when it wasn't pointed directly at the device, speculate as to how this might happen.

11. What type of electromagnetic energy do you think your remote control is producing?

12. Based on your answer to # 11 above, look on a chart that has information regarding the electromagnetic spectrum and write the approximate wavelength and frequency of this type of radiation.

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Building and Testing a Spectroscope–Directions

Name: _____ Date: _____

1. Be sure you have a cardboard tube, some aluminum foil, a small square of tagboard with a hole in the center, a small piece of diffraction grating, tape, scissors, and a razor blade.

2. Cut the square of tagboard so that it is just big enough to cover one end of the cardboard tube.

3. Tape the small square of plastic over the hole in the piece of tagboard. Don't cover the grating or the hole with tape. This special plastic is called a *diffraction grating.* Don't smudge it with your fingers!

4. Tape the tagboard piece to one end of the cardboard tube, with the hole centered and the diffraction grating on the inside.

5. Cover the other end of the tube with aluminum foil, pulling it tight and smooth.

6. Cut a small slit across the center of the foil with the razor. Make it very thin.

7. Put your eye to the diffraction grating window and point the slit at the other end of the tube directly at a bright light source in the room.

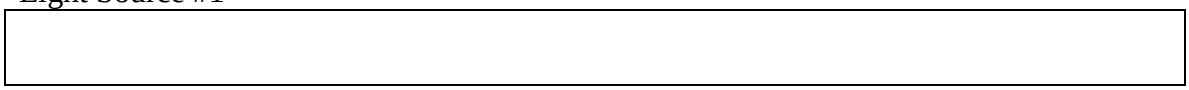
8. Rotate the tube within the aluminum foil cap until you see the best separation of colors. Tape the foil in place.

9. Take 10 minutes to carefully observe different light sources in the room. Your teacher may have a candle, a white light bulb, an image-projector bulb, an overhead-projector bulb, or other sources of light. Do not look at the Sun. Using colored pencils or markers, draw as carefully as you can what you observe when you point the spectroscope at a light source, paying special attention to the number of spectral lines and their colors.

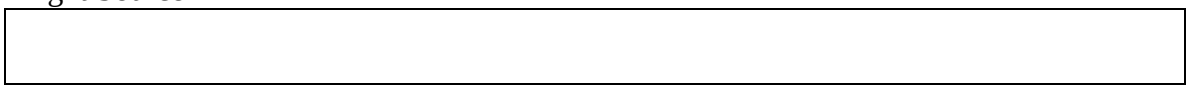
   Record your observations in the spaces provided below:

Figure 6.2

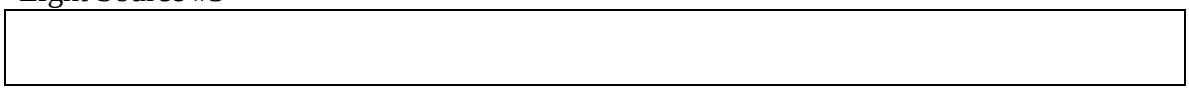
Light Source #1



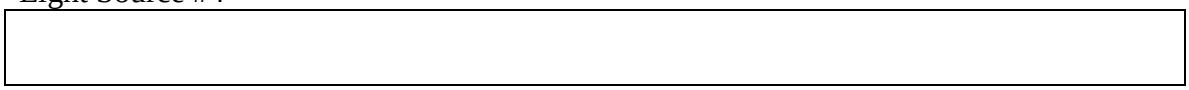
Light Source #2



Light Source #3



Light Source #4



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Using Your Spectroscope–Worksheet

Name: _____ Date: _____

Your mission for homework is to study four different sources of light with the spectroscope that you made today. Ideas of what to look at might be: street lamps (if they are different colors, they will give off different emission spectra), the color television, the light bulb in your refrigerator, the Moon, a star, any lights around your house, neon signs at a store in your neighborhood, candle flames, light from a gas stove (observe with parental permission, and the lights on) or anything else that gives off light. Do not look at the Sun.

Using colored pencils or markers, draw as carefully as you can what you observe when you point the spectroscope at a light source, paying special attention to the number of spectral lines and their colors.

Record your observations in the spaces provided below:

Figure 6.3

Light Source #1

Light Source #2

Light Source #3

Light Source #4

1. What do you think is the source of the colors that you are observing?

2. Why do you think that the lines, called "spectral lines," are different when you look at sources of white light that for the most part seem to look the same to our eyes?

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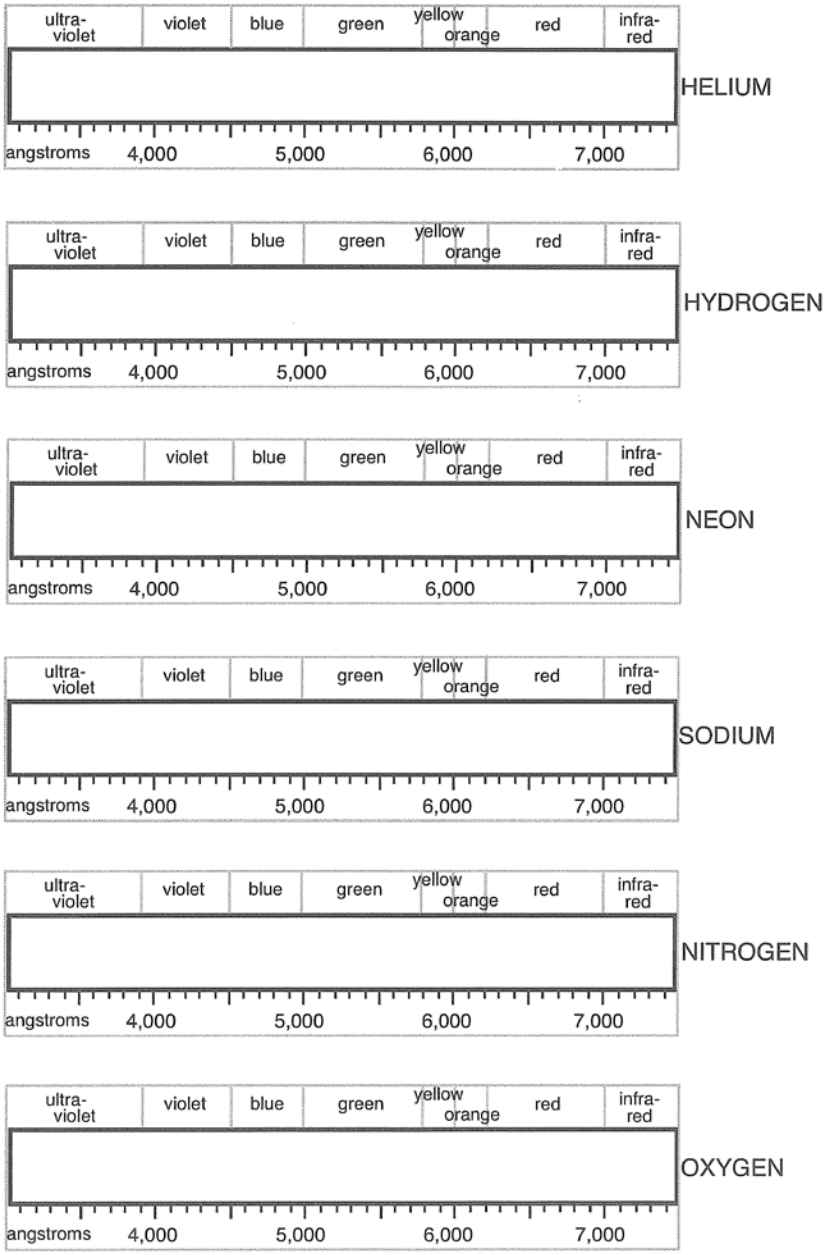
Spectrum Observation–Worksheet

Name: _____ Date: _____

Figure 6.4.



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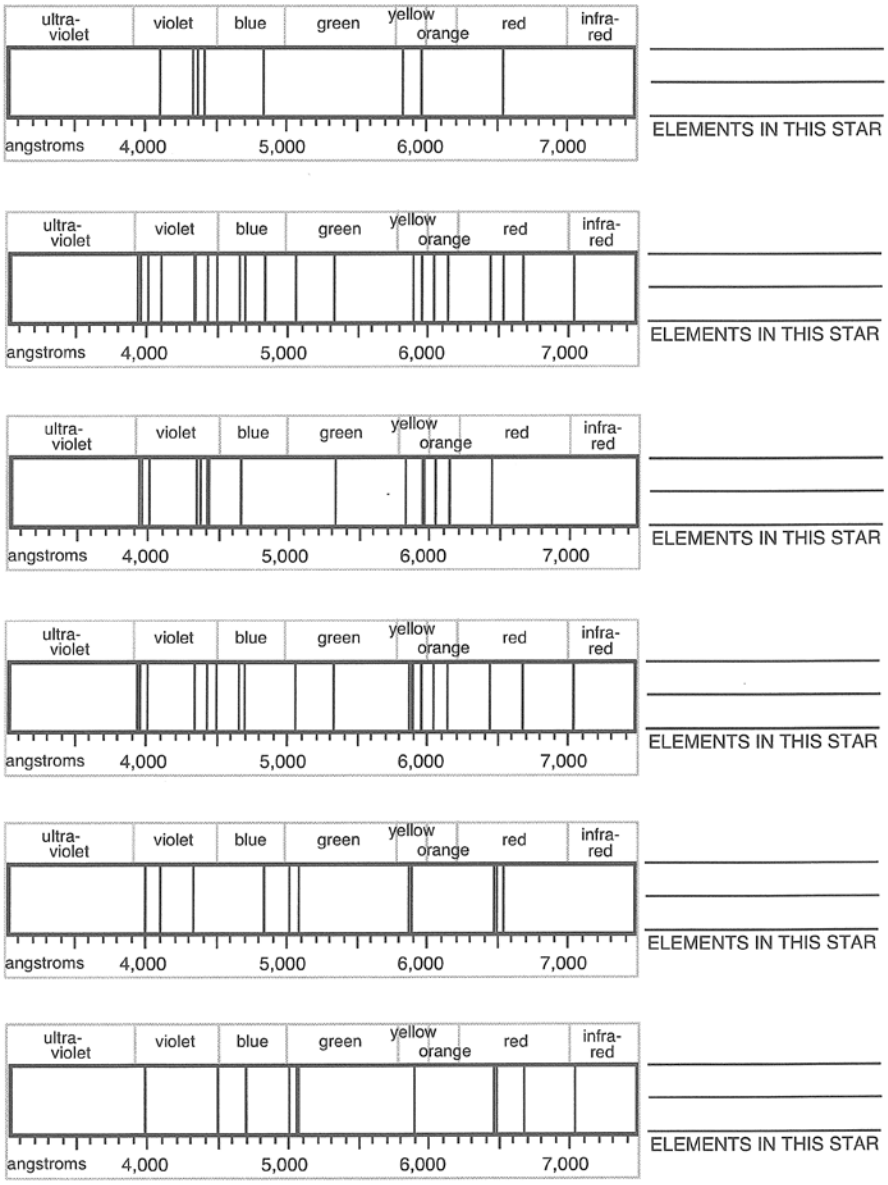
Unknown Stars–Worksheet

Name: _____ Date: _____

Figure 6.5.



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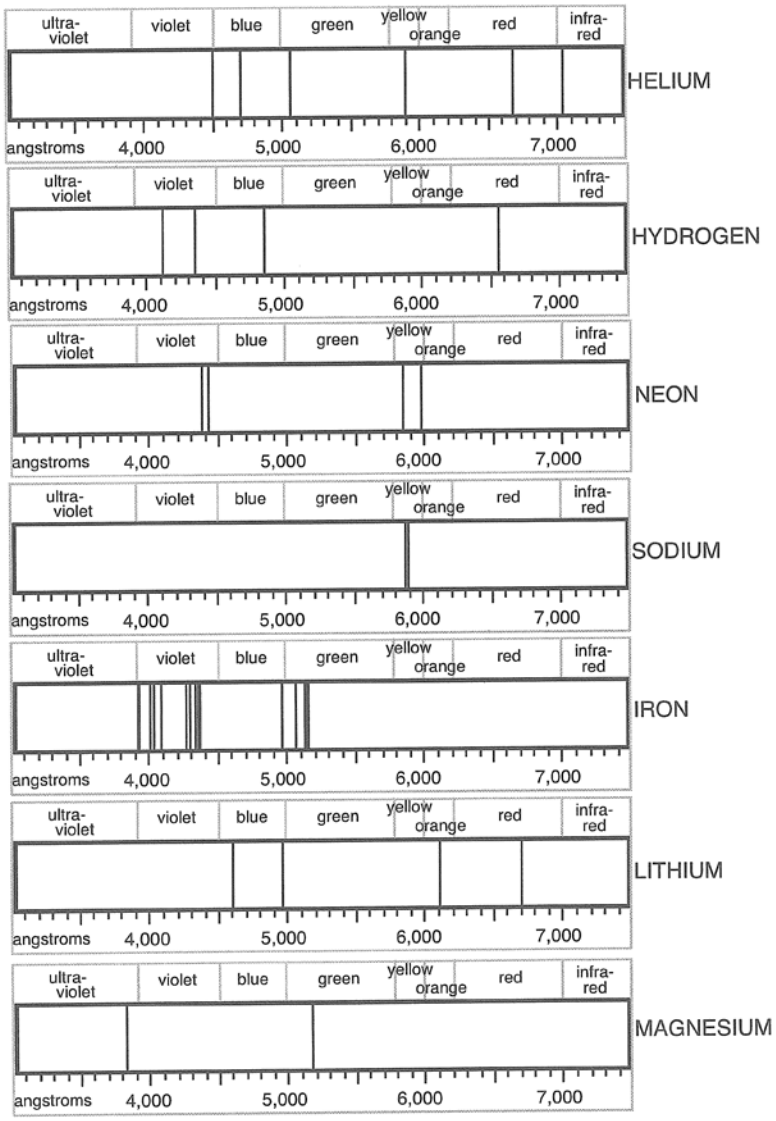
Project Procyon: Spectra of Seven Elements – Worksheet

Name: _____ Date: _____

The following spectra are printed in black and white instead of in color, but they represent colored bands. If you wish, you may add the correct colors with pencils or pens.

Figure 6.6.



Mission 6
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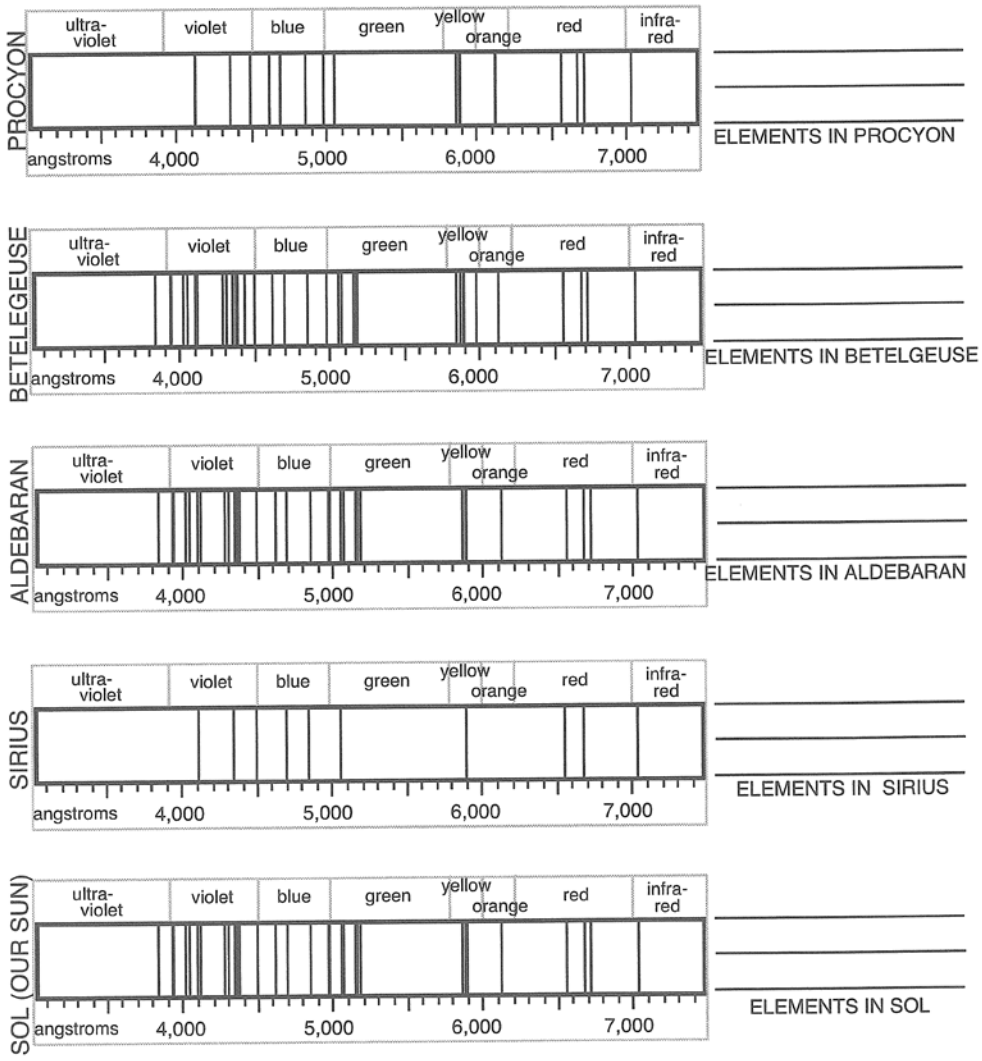
Project Procyon: Spectra of Five Stars—Worksheet

Name: _____ Date: _____

The following spectra are printed in black and white, but they represent the stellar spectra,

Figure 6.7.



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The Chemical Elements in Stars

Project Procyon: Questions–Worksheet

Name: _____Date: _____

1. What elements did you see in class that is not listed in "Project Procyon"?

2. What elements are listed in "Project Procyon" that you did not see in class?

3. Why do you think these lists of elements are different? (If they are different!)

4. Use the "Spectra of Seven Elements" worksheet to compare with the "Spectra of Five Stars" worksheet. These spectra are printed in black and white. They represent the stellar spectra.

   List all of these seven elements that you found in each of the following stars:

   Procyon:

   Betelgeuse:

   Aldebaran:

   Sirius:

   Sol (our Sun):

5. Are all seven elements found in all five stars? How can you tell?

6. Which of the seven elements can be found in all five stars?

7. What do you think the "extra" spectral lines in some stars are?

8. Why do you think that some lines are thicker than other lines?

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