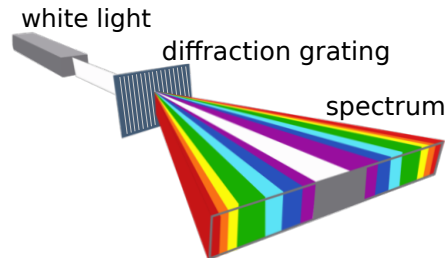
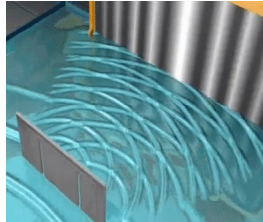


Rainbows and Slits: Diffraction Spectra

- When light waves go through a grate of thin slits they make a "diffraction pattern" with dark and bright spots
- Different colors of light make wider or narrower patterns.
- White light has many colors mixed together. When passing through a diffraction grating, it splits into a rainbow.



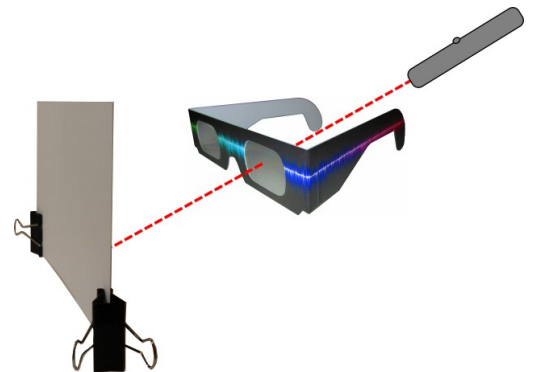
Work with a partner!

Part 1: Diffraction Patterns

1. Use 2 binder clips and a piece of cardstock to make a vertical screen.
2. Place the diffraction glasses about 1 foot in front of the screen.
3. Shine a **red laser pointer** through the glasses at the screen.

- Draw the diffraction pattern you see on the screen:

- What happens to the pattern dots if you move the laser closer to the glasses?



Circle one: further apart closer together unchanged

- What happens to the pattern dots if you move the glasses closer to the screen?

 further apart closer together unchanged

4. Make a prediction:

- Sketch what you think the pattern will look like if you shine the laser through 2 glasses, one after the other:

5. Now try putting 2 glasses in front of the laser. Was your prediction close?

6. Shine a **green laser** and a **red laser** through **one pair** of glasses, at the same time. (Share 1 green laser per table). Line up one red dot with one green dot.

Which diffraction pattern has the dots further apart?: **red** **green**

Part 2: Making Rainbows with Diffraction

White light includes light waves of many different colors mixed together. When white light shines through a diffraction grating, different colors will spread out different amounts, and you'll see the colors separate to make a rainbow!

1. Think about what you just saw with the laser, and make a prediction:

When white light goes through a diffraction grating, which rainbow color do you expect to be further away from the light source? Circle one.

Red Green

Put on your glass and look up at the ceiling lights - **were you right?**

Different sources of white light mix different combinations of colors.

Safety warning: only parents should light the candle and plug in / take out light bulbs. Turn off the light-bulbs once you've looked at them - they will get hot!

Put on your diffraction glasses and look at these light sources:

(a) A lit candle

(b) A fluorescent lamp

(c) An incandescent lamp

(d) The white LED light on your red laser pointer

(look at it from the side, don't point it in your eye!)

fire incandescent fluorescent



Which has the least blue (compared to red) light?:

LED



Which has the most blue (compared to red) light?

Which has separate, distinct colors (not the full rainbow of colors blurred together)?:

Fluorescent bulbs make light by using electricity to excite chemicals called "phosphors". Each chemical releases a very specific color of light, to produce light containing a few separate colors. Other light sources (like fire) produce a whole continuous spectrum of colors to make a full rainbow.