

# Sky in a Jar

**Overview:** Have you ever wondered why the sky is blue? Or why the sunset is red? Or what color our sunset would be if we had a blue giant instead of a white star? This lab will answer those questions by showing how light is scattered by the atmosphere.

**What to Learn:** Particles in the atmosphere determine the color of the planet and the colors we see on its surface. The color of the star also affects the color of the sunset and of the planet. The color of light striking an object affects how our eyes see it.

## Materials

- glass jar
- flashlight
- fingernail polish (red, yellow, green, blue)
- clear tape
- water
- dark room
- few drops of milk

## Experiment

1. Make your room as *dark* as possible for this experiment to work.
2. Make sure your label is removed from the glass jar or you won't be able to see what's going on.
3. Fill the clear glass jar with water.
4. Add a teaspoon or two of milk (or cornstarch) and swirl.
5. Shine the flashlight down from the top and look from the side – the water should have a bluish hue. The small milk droplets scatter the light the same way our atmosphere's dust particles scatter sunlight.
6. Try shining the light up from the base – where do you need to look in order to see a faint red/pink tint? If not, it's because you are looking for hues that match our real atmosphere, and the jar just isn't that big, nor is your flashlight strong enough! Instead, look for a very *slight* color shift. If you do this experiment after being in the dark for about 10 minutes (letting your eyes adjust to the lack of light), it is easier to see the subtle color changes. Just be careful that you don't let the brilliant flashlight ruin your newly acquired night-vision, or you'll have to start the 10 minutes all over again.
7. If you are still having trouble seeing the color changes, shine your light through the jar and onto an index card on the other side. You should see slight color changes on the white card.
8. Cover the flashlight lens with clear tape.
9. Paint on the tape (not the lens) the fingernail polish you need to complete the table.
10. Repeat steps 7-9 and record your data.

## Sky in a Jar Data Table

Flashlight Color	Location	Color(s)
<i>White</i>	<i>Side of jar</i>	
<i>White</i>	<i>Bottom of Jar</i>	
<i>Red</i>	<i>Side of jar</i>	
<i>Red</i>	<i>Bottom of Jar</i>	
<i>Yellow</i>	<i>Side of jar</i>	
<i>Yellow</i>	<i>Bottom of Jar</i>	
<i>Green</i>	<i>Side of jar</i>	
<i>Green</i>	<i>Bottom of Jar</i>	
<i>Blue</i>	<i>Side of jar</i>	
<i>Blue</i>	<i>Bottom of Jar</i>	

### Reading

Why is the sunset red? The colors you see in the sky depend on how light bounces around. The red/orange colors of sunset and sunrise happen because of the low angle the sun makes with the atmosphere, skipping the light off dust and dirt (not to mention solid aerosols, soot, and smog). Sunsets are usually more spectacular than sunrises, as more “stuff” floats around at the end of the day (there are less particles present in the mornings). Sometimes just after sunset, a green flash can be seen ejecting from the setting sun.

The Earth appears blue to the astronauts in space because the shorter, faster wavelengths are reflected off the upper atmosphere. The sunsets appear red because the slower, longer wavelengths bounce off the clouds.

Sunsets on other planets are different because they are farther (or closer) to the sun, and also because they have a different atmosphere than planet Earth. The image shown here is a sunset on Mars.

### Exercises

1. What colors does the sunset go through?
2. Does the color of the light source matter?

**Answers to Exercises: Sky in a Jar**

1. What colors does the sunset go through? (The sunset goes through the colors of the rainbow as the sun sets lower in the sky, starting with yellow, then orange, and then red as it sets.)
2. Does the color of the light source matter? (Yes. White light gives the best results.)