

# Atomic Spectra Virtual Lab

mrsajdak.com/spectra

Name \_\_\_\_\_

Date \_\_\_\_\_

Period \_\_\_\_\_

Atoms take in energy. Then they give it back as light. Each element gives off its own set of colors. In this lab you will light up gas tubes, look at them through spectroscope glasses, and zoom in to see why.

## Part 1. Light it up (Bench view)

SEP 3, 4 • CCC Patterns

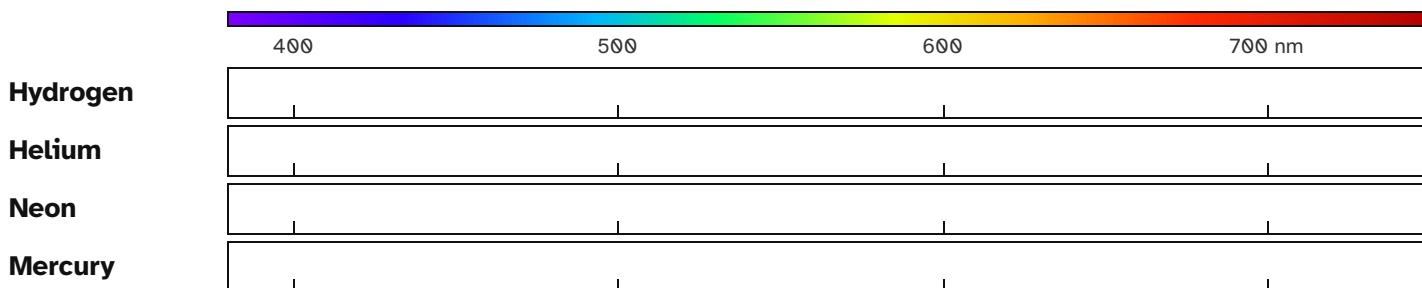
Click the **H** tube on the rack. Flip the switch on the power supply.

1. What color does the hydrogen tube glow? \_\_\_\_\_

Press **Put on spectroscope glasses**.

2. What happened to the glow when you put on the glasses?

3. Load each tube below. Look through the glasses. Draw the bright lines you see in the right place and color them in.



4. Fill in the table.

| Gas      | Color of the glow | How many bright lines? | Brightest line's color |
|----------|-------------------|------------------------|------------------------|
| Hydrogen |                   |                        |                        |
| Helium   |                   |                        |                        |
| Neon     |                   |                        |                        |
| Mercury  |                   |                        |                        |

5. Two tubes can glow almost the same color. Why are the lines a better way to tell them apart?

## Part 2. Inside the tube (Click the glowing tube)

SEP 2 • CCC Cause and Effect

6. The small blue dots race through the gas. What are they, and where do they come from?

7. Press the **Freeze** button. Find an atom with a photon leaving it. What had to happen to that atom first?

8. Every model leaves something out. This one says "Not to scale." Name one way real atoms are different from the model.

### Part 3. One hydrogen atom (Load hydrogen, then press One atom)

SEP 4, 5 • CCC Energy and Matter

Use the drop buttons (**3 to 2**, **4 to 2**, and so on). Leave **Show wavelengths and colors** checked. Read the box at the top right after each drop.

9. Fill in the table.

| Drop                      | Color of light | Wavelength (nm) | Energy released (eV) | Wavelength × Energy |
|---------------------------|----------------|-----------------|----------------------|---------------------|
| $n = 3 \rightarrow n = 2$ |                |                 |                      |                     |
| $n = 4 \rightarrow n = 2$ |                |                 |                      |                     |
| $n = 5 \rightarrow n = 2$ |                |                 |                      |                     |
| $n = 6 \rightarrow n = 2$ |                |                 |                      |                     |
| $n = 2 \rightarrow n = 1$ |                |                 |                      |                     |

10. Multiply each wavelength by its energy. Write it in the last column. What do you notice?

11. Which drop released the most energy? \_\_\_\_\_ Could you see its light? \_\_\_\_\_

12. Finish the pattern: A bigger drop releases \_\_\_\_\_ energy and makes light with a \_\_\_\_\_ wavelength.

### Part 4. Mystery tubes (Press Mystery tube)

SEP 7 • CCC Patterns

Look at the glow and put on the glasses. Compare the lines to the **Fingerprints** chart. Make your guess before you press **Reveal**.

| Trial | What lines did you see? (colors and where) | My guess | It was |
|-------|--------------------------------------------|----------|--------|
| 1     |                                            |          |        |
| 2     |                                            |          |        |

13. Pick one mystery tube. **Claim:** It was \_\_\_\_\_. **Evidence:** Which lines proved it? **Reasoning:** Why do those lines prove it?

### Part 5. More electrons, more colors

SEP 2, 6 • CCC Structure and Function

14. Load neon and turn it on. Look at the Energy levels diagram. About how many arrows are there? \_\_\_\_\_ Hydrogen has only 4 visible lines. Why does neon have so many more?

15. Load nitrogen ( $N_2$ ). Look through the glasses. How do its lines look different from an atom's lines? Why?

### Wrap it up

SEP 6, 8 • CCC Scale, Proportion, and Quantity

16. Scientists have never visited a star. But they know stars are made mostly of hydrogen and helium. Use what you learned to explain how they know.