

Chapter 3: Instructions for Students with Color-Vision Deficiency or Color Blindness

Chemistry relies to some degree on qualitative observations and data. However, if you perceive color differently than most people sometimes making these observation can be challenging. People who perceive color differently than the average person are described as having *color vision deficiency* or *color blindness*. No need to worry, you can still do chemistry! John Dalton, a very influential chemist who contributed to atomic theory, actually had color blindness and came up with an early theory about how colorblindness works.¹

Follow the instructions below to complete the Flame Test and Atomic Spectra Lab.

Download the Color Blind Pal App

- Apple: <https://apps.apple.com/gb/app/color-blind-pal/id1037744228>
- Android: https://play.google.com/store/apps/details?id=com.colorblindpal.colorblindpal&hl=en_US

The Color Blind Pal app allows you to focus your camera on something and it will verify the color of that item. To begin, open the app and click on the "i" in the circle to pull up the settings page.

- Read through "How to use this app"
- Select your color blindness type

You are now ready to complete the lab.

Part A: Flame Tests in Beyond Labz

- Open the Beyond Labs platform and navigate to the Flame tests lab using the instructions in the report.
- When you are performing each flame test, a window should pop up with a video of the flame produced when burning the cation.
- Hold your phone camera up to the screen in the flame viewing window.
- Click "Freeze". This will freeze the image as a picture.
- Adjust the target on the screen to be placed in the middle of flame. The color of the flame under the target will be displayed at the bottom of the screen in text form. Use these text color readouts to fill in data for the flame tests observations in the lab.
- The example shown below is for Sodium ion (Na^+) (Figure 1). The target is on the flame and the color readout says "Very Faint Orange". See the image below for reference:

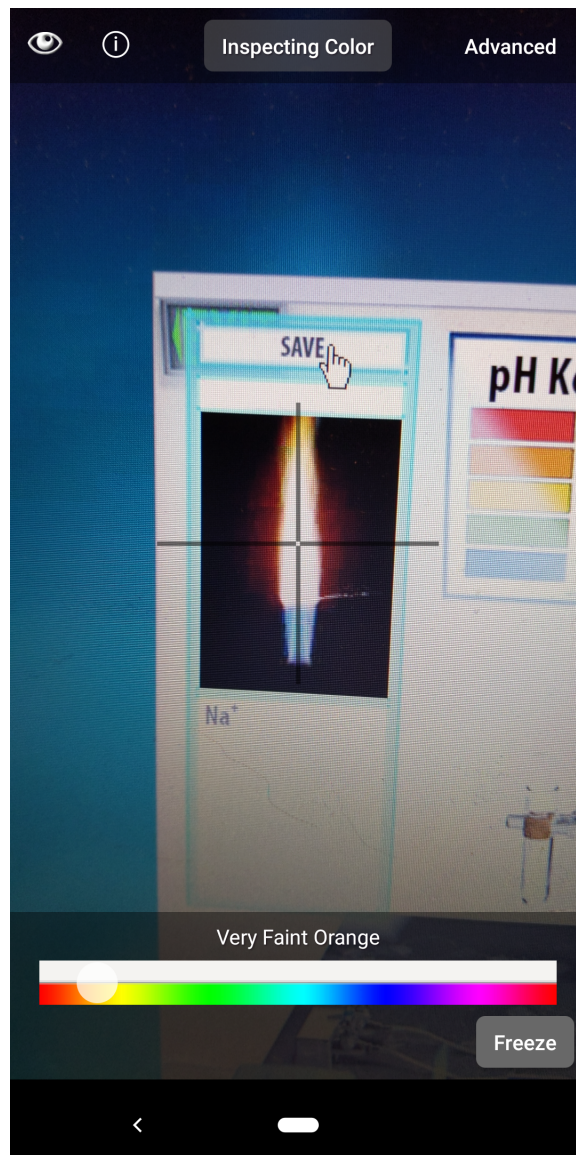


Figure 1: Image captured using the Color Blind Pal app of Sodium ion being burned in a flame test showing an orange colored flame

Part B: Atomic Emission Spectra

Part B of the lab doesn't require observing colors directly, instead you will look at the most intense peak on the emission spectrum and see what wavelengths (in nanometers) of the visible spectrum they are related to. These wavelengths have colors which correspond to them. Please contact your Teaching Assistant if you run into any issues in this part of the lab.

In this part of the lab, depending on your type of color vision deficiency, you may be able to identify which wavelength ranges of the visible spectrum you see differently. For example, objects that the average human eye perceives as "red" absorb all colors in the visible spectrum except those in the wavelength range : 700–635 nm instead those colors are reflected back and perceived by the human eye as the color red. People with a color vision deficiency might not be able to distinguish between certain colors within the red wavelength range. When some of the wavelengths in the range 700-635 nm are reflected back to the eye of a person with a color vision deficiency they may be perceived in a way that is difficult to distinguish from other visible wavelengths of light. ²

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