Hand built pottery for beginners

Loading electrons in atoms normally handles the lowest energy states possible. An atom so hard to be in the state was. However, electrons can be excited to state high energy when they absorb excess energy. The energy can be exceeded given to heat, light, or electric discharge. The electrons then returned to lower state of energy, eventually returning all the way to the ground state. As electrons are returning to lower energy states, they release their excess energy. Many times, this excess energy is released in the form of light, and each atom or molecule releases a single photon of light for every electronic energy transition it makes. In the hydrogen discharge tube used in this experiment, the energy of the electrical discharge first disociates \(\ce {H2}\ molecules of \ (\ce {H}) atom, then excite the electrons of the \(\ce{H}\atom in high energy state. Due to energy conservation, the amount of energy in an emitant photon will exactly match the amount of energy absorbed by the electrons as it moves to the lower energy state. Different colors of light are associated with different photon energy. For example, a single photographn of blue light has more energy than a single photographn of red light. So the flow of the light emitted by a particular atom depends on how much energy are electronic as it moves down to a lower energy level. The energy levels allowed for each atom depend on the number and arrangement of protons and electrons in the atom. So each component has different energy states available in it, so each component releases photons of different colors when its atoms return to their lower energy state. Since each atom was very excited state (high energy levels) available to it, multiple flows of light can be emitted by each component. The set of individual colors emitted by an element is called its spectcle. Since the spectrum of each component is unique, Morph can be used like fingerprint to identify unknown elements. Lifts Light is a kind of electromagretic radiation. The cerebration of radiation determines what kind of radiation it is. The human eye is able to detect only a narrow range of electromaganatic radiation, those from about 400nm to about 700nm. Radiation and wavelench less than 400nm is classified as ultraviolet, x-ray, or \(\Gamma\radiation, while radiation with length longer than 700 nm is classified as infrared radiation, micro-join, and radio waves. In this experience, we use our eyes to detect the radiation emitted by atoms excited and, therefore, we work only with the Color's visible light to light related to its length (\(\lambda\)), which is related to its frequency (\(u\)) and the energy of its photographn (\(E\)). Shorter light longoms (at the blue end of the visible spectrum) have higher frequency and higher photon energy while longer in light (at the red end of the spectrum) there is lower frequency and less energy per photon. It is easy to convert between photon energy, pavement, and frequency using the following relationships where \(c\) = the speed of light =\(2.998\times 10^8 m/s\s\(h\\The Planck Constant==(6.62 6\times 10^{-34}Js\).\[\lambda u=c\] and \[E=H=u\These two combined relationships provide a third:\ [E=dfrac{hc}\lambda}\ so The spectrum of a component can be declared in the list of lengths in particular in light that its atoms emit. To measure these pavements in the lab, we must first separate them. In the naked eye, the various pavements (colors) of light emitted by an element are mixed together and displayed as a single color which is a combination of the inserted colors. If we see the light through a prism or a reservoir of difficulty, however, individual lengths are separated. A difraction reservoir is a piece of glass or plastic key with many narrow lines and properly specify lines on it. As the light comes out of light after being reflected by the reservoir, these small lines cause light that reflect to interfere with itself in such a way that the different lengths of the light appear in different positions on the left and right in the original direction in which the light was travelling. See the figure below. Using a light source that has known pads of light, we can measure exactly where each known pad is displayed on a master stick. Since this position depends on the length of a linear manner, a graph vs. wave. in the position the spectral line will yield a straight line. Once the best right fit line has been determined, the equation in this line can then be used to convert the position of other variable pageant lines. For example, using the same device and without moving the relative positions of the master logs, difraction grid with lamps, it is possible to view the equation of a new element, measure where its spectator lines occur on the master stick, and then read the graph or use the equation in the line to determine the length that each of these corresponding positions. The calibration graph is therefore an integral part of the spectroscope. Positions are measured by using the master logs, then the pavement is determined in the positions using the graph itself or the equation of the best fit line for this graph. For atoms with a single electron, the theory of atomic structures proposed by Niels Bohr can be used to calculate length for transitions between particular electronic energy levels in the atom. In this experience, the only electron atom we will consider is hydrogen. (Note, there are other one-electron atoms if you consider ion such as \(\ce {^^}),\(\ce{Read{2}}}), etc.) Use the bohr theory for hydrogen, you should find a close match between calculating pavements with those that you measure experimentally. To calculate the padle light emitted by hydrogen atoms, remember that an electron energy of the n-th energy level of a one-electron atom is provided at \[E_n=-\dfrac {Z^2R}{n^2}] where \(R\) is the constant Rydberg == (2.18\times 10^{-18}J\),\(Z\) is the nuclear load, and n = 1, 2, The 3, ..., ∞. For hydrogen, The nuclear load is 1 for this equation gets: \[E_n = -\frac{R}{n^2}] Change of energy for the electron when it makes a transition from one EML level of another is provided by its initial subtractions to its final energy: \[\delta E_{text{electron}}=E_f-E_i\Not conservation of energy , photon's energy emitted as this electron drops to a lower energy level must equal the change in energy for the electron. However, since photon energy must be a positive amount, the absolute value of the change in energy for the electron must be used: \[E_{\text{photon}} ||\Delta E_{text{electron}} |} Once the energy of the photon is known, it is easily converted to a length as discussed earlier \[E_{text{photon}}= \frac{hc}{\lambda}] or \\lambda=\frac{hc}{{ E_{text{photon}}}} because there are many possible energy levels for the electron of a large atom, and because the electron could jump from any higher n to any lower n , there are many lines in the spectrum of hydrogen. However, most of these lines occur at pavements that our eyes cannot detect (either infrared or ultravolet). The visible portion of the spectrum which you will observe in this experiment was the first to be studied by scientists since it is the only portion that can be seen with the naked eye. This series of pageant lines named for one of the scientists first studied it and called the balmer series. Note that all the pageant lines in the balmeric range involve in transitioning from a US level to our highest level at the level n=2. You'll need the following information to complete the calculations for your lab report. Materials and high voltage equipment power supply; hydrogen, mercury, and other polielectronic element tubes disposal; the bolt wooden meter in a form T; a grape of difraction; a flashlight, ring standing. Safety Use extreme caution near the high voltage power supply! Severe severe trauma are possible. Do not touch the front of the power supply while it is the plug! Make sure to turn it off and unplug it before changing matrix tubes. Allow cool dribbling tubes before attempting to remove them from the power supply. They become very hot and used. View the lights emitted by the disgusting tubes of glasses or glasses. Both glass and plastic glasses will absorb most of the deadly UV rays emitted by many atoms. Works in Group 4 unless instructed otherwise. Choose a workspace on one of the bench's top away alternate sources of light. Get 3 ring stands with rings are made so they are all at exactly the same height, about 6 inches above the bench top. Get a pair of wooden snaps that were bolted together in a T shape. Set the rings standing under the end of the master wood so the master arrangement is held about 6 inches above the bench top A is level. Place a high voltage power supply (5000 V - HAZARD!! - NO TOUCH IF PLUGGED IN!!) that has a mercury discharge tube at the intersection point of the two meters ships as shown in the face on the next page. (Note that this is a supply for very high voltage power! You have to be careful to never touch it when it is to plug in. When you need to insert or remove a unloading tube, turn it off AND unplog it before touching the tube. Also note that the tubes become hot from use. You must leave them cool before you try to remove them.) Mount a grating difraction made by a tire cap to a utility clamp attached with a ring stand. Set the stand ring for the difraction reservoir centered on the vertical meter bridge and located about 20 cm from the free end of wood to vertical meter. See the following figure shows the experimental device. Make sure you don't hit the master rods, stand rings, or grating difractions! If any of these elements move through the experiment, the results will be less accurate. You'll need to move the power supply switch disgusting tube, so it's a good idea to mark it in prime position with masking tapes so you can make sure you put in back in the same position every time. Make sure you have a mercury (\\ce {Hg}\)) to discharge the supply tube for your power then turn it on. Spectrum of well-known mercury. It contains four visible wavelengths which are easily viewed: Wavelength Color Violet 404.7 nm Blue 435.8 nm Green 546.1nm Yellow 579.0 nm When you watch mercury lamps across your toasted difraction, you should see each of these four colors in various positions along your master's horizontal stick. You can use either the spectcle on the left side of the lamp or on the right. It doesn't matter because they're the same, but you'd be consistent for the rest of the experience. Measure the distance of cm in each line of the mercury spectical from the center of the master wood where the lamp is located. Note that the center of the master stick is at 50 cm so you'll have to offset that. Print these positions in Table 1 on your data sheet. Use Excel to make a graph of wave length (at nm) vs position (in cm) from your data point card for mercury. Wavelength should be on the axis, position on the x axis. Get the equation in the best fit line right for that data and record it on your data sheet. For help using Excel, see the Excel Graphing Exercise on Chemistry 11 Experiment Lab Websites. Now that you have positions of equations related to strength for your spectroscopy, you use it to convert any position measured on your spectroscope to a length. So you can now measure pads from any light source by first measuring their position on your spectroscope and then using your graph to convert this position to a length. Note that don't move your master bat or spare your difraction! If the relative positions of these items change, the calibration line and its equations will no longer be correct. Part B: The Spectrum of a Polyelectronic Element Chooses another dislocated tube from the given boxes. Do not select hydrogen because you will use this tube in the next part of the experience. Print the element name you chose above Table 2 on the data sheet. While the power equipment is discovered, remove the mercury flow tube, ride the new tube in the power supply, then plug it in and turn it on. Use Chart 2 to record the color of the five bright spectator lines you see and their corresponding position on the spectroscopy. When you are finished, turn off your power supply and then use your calibration equation to determine the lines that you saw. Use one of the lab computers to go to . Select the element name you have selected, then click the box marked False Line. Scan the wave column for the wavelench you measure to see if you can find any lock matches. Note that the only lines you'll likely observe are those with the greatest intensity (see the Intensity column next to their length). In Table 2, recommend the cerebral in-table for the intense line nearest each pane you observe. Calculate the error % for each of your measured lengths. With the power supply unplug, put a hydrogen tube into your power supply then plug it in and turn it on. Print the colors and positions of the lines you see in Table 3. When you are finished, use your calibration equation to determine the lines that you saw. Using information discussed earlier regarding Bohr's theory, calculated the cerebrush of the six first lines of the Balmer series. Record the results you calculate in Table 4. Compare the pads you calculate with your measuring pane. See if you can determine which electronic transition (from n = → n = 2) that are responsible for each of the lines you saw in the hydrogen spectrum. Record your results in Table 5 and calculate your percent errors per line. Supposing that the calculated length is the current wavelength: \\\text {% error } = \frac{}\text{observe wavelength}-\text{current waverngth|}} {\ text {current waveleng}}\times 100\Calculate the energy at the level n = 1 for an electron in a hydrogen atom. Calculate the energy of N= 2 levels for an electron in a hydrogen atom. Calculate the energy change when an electron in a atom move from n = 2 n = 1. Calculates the length of the light that an electron of a hydrogen atom would emit if it moved from n = 2 n = 1. We cannot see the light emitted by hydrogen atoms when electrons are moved from any upper level to the level n=1. why not? Table 1: Broadcast Spectrum of Mercury Color Position from the Spectroscope Center (cm) Wavelength (nm) Violet 404.7 blue 435.8 green 546.1 yellow 579 0 Ekw the best fit line from Excel (\\lambda=mx+b\), where \(x\) = position): R2:_______________________ Your teacher can ask you to attach a copy of your graph. Check with your teacher to see if necessary. Table 2: Atomic Spectrum of _____________ Color at position of selected Spectral line in Center of Spectroscope (cm) measure wavelength(nm) (From Calibration Graph) Actual Wavelength(nm) (From NIST Website) Error Rate of Measuring Tabs Table 3: Atomic Spect in Hydrogen Color Position from Center of Spectroscope (cm) Waveleng(nm) (From Calibration Graph) Purple Violet green-blue 1 Violet 2 Table 4 : The first four lines of the Balmer Upper Energy Series of Upper Level (J) Lower Energy in Lower Level (J) Switch to Energy of the Electron (J) Energy of the Emitted Photon (J) Wavelength of Emitted Photon (nm) 3 2 4 2 5 2 6 Table 5: Comparison of Observing and Theoretical Results for Hydrogen Observe Wavelength (from Table 3) Calculate Wavelength (from Table 4) Electronic Transition (from Table 4) Percentage Error at measuring pavement length