Fluorescent light, incandescent light, and hydrogen discharge light are very similar in the fact that they release a photon to create light (How Stuff Works 2). In atoms, when the electrons are in an excited state, they jump. Due to the large amount of energy needed to be held in a higher orbital, electrons fall quickly. During the fall, the electron releases energy. The release of energy comes in the form of a light photon (2). These photons have then been refined and applied to each light source. The goal of any light source is to channel photons through a chemical reaction. Thus, this makes fluorescent light, incandescent light, and hydrogen discharge similar because they all use a chemical reaction (2).

These chemical reactions also cause a major difference between the three light sources. For fluorescent lighting, it all begins with an electrical current traveling down the tube. This causes the negatively charged electrons to move to the positive side of the tube. When the electrons quickly travel to the other side of the tube, they collide with the large mercury atoms. Thus, the electrons become excited and travel to the next energy level. After all the energy is released, they fall down releasing a photon (2). The light spectrum from an electron comes from the different electron configuration in the atom. All elements have differing arrangements and scientists have found:

> 'The electrons in mercury atoms are arranged in such a way that they mostly release ultraviolet wavelength range. Our eyes don't register ultraviolet photons, so this sort of light needs to be converted into visible light to illuminate the lamp" (3).

This has to be countered to create a visible light source which is done by using a phosphorus coating.

Incandescent lighting uses a polar opposite technique: heat. Incandescent light is formed when a filament, generally tungsten, is heated, it begins to glow due to energy transfer through the electrons in the bulb (Wise Geek I). Similar to the fluorescent bulb, the electrons in the tungsten become excited and release a photon due to the process described above. "About 12% of the radiation is visible light" **(I).** As a result, no method is required to turn it into visible light.

The final lighting method is hydrogen discharge. This works similar to the fluorescent lighting due to the fact that the electrons in hydrogen are excited from an electrical current traveling through the tube. When the electrons become excited from the electricity, they jump energy levels. This method differs from the fact that no gas or heat is used to excite the atoms. They move due to the electricity and how it reacts with hydrogen.

The similarities and differences cannot only be described from the creation of each light source, but also through experimentation and diffraction gratings. Each of the light sources contains a red and green band, except for fluorescent light. Incandescent light releases the most visible light while fluorescent light releases the least, containing only one band of visible light. Incandescent light and hydrogen light had very similar bands except for the fact that the incandescent light contained blue while hydrogen discharge contained purple. These differences and similarities can be accounted for due to the fact each element contained in the light source has a different electron configuration (How Stuff Works 2). The differences are dictated by the fact that each element has a number of orbitals. Hydrogen has only one electron causing it to occur at a lower diffraction scale while tungsten and the elements contained inside a fluorescent light have a higher number of electrons thus allowing more energy to be released as it falls.

The final way to determine similarities and differences between the three light sources is through a mathematical equation, specifically the Bohr model. This model demonstrates the correlation between levels moved and the amount of energy released: $E = -Rhc(\frac{1}{n2f} - \frac{1}{n2i})$ For the four hydrogen emission lines, this equation was used to find the amount of energy released.

A) n=6 → n=2

-4.84 x 10^{-19}

B) n= 5→ n=2

-4.57 x 10^{-19}

C) n=4 → n=2

-4.08 x 10^{-19}

D) n=3 → n=5

-3.03 x 10^{-19}

This information can now be used to find the wavelength, with the equation: $E = hc/\lambda$.

A) 2.44 x10^{6}

B) 2.30 x10^{6}

C) 2.05 x 10^{6}

D) 1.53 x 10^{6}

These lines demonstrate a correlation between the amount of energy lost and the height of the electron in the orbital, the higher the electron jumped the higher the energy released.

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