



What is the universe made of?

01 Write the name of an element from the periodic table. Then, research it and write a summary of what you learned. Compare descriptions with a classmate who researched a different element.

02 Read “The Universe Is a Live Wire.” Write “T” if the statements are true, “F” if they are false, and “NM” if they are not mentioned.

- All kinds of matter have identical spectra.
- Spectroscopy can have applications in medicine to diagnose some illnesses.
- Photons are absorbed when electrons move up a level.
- The energy emitted when an electron moves down is inverse to the amount absorbed when an electron moves up.

03 Read the text again. Match the definition to the words in bold from the text.

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|---------------|---|
| 1. spectrum | a. take in and utilize |
| 2. photons | b. the combination of light waves and particles |
| 3. absorbed | c. opposite |
| 4. wavelength | d. particles of energy |
| 5. emission | e. the release of energy |
| 6. inverse | f. the distance between two successive points on a wave |

The Universe Is a Live Wire

Astronomers use spectroscopy to help them understand the composition of the universe and everything it contains. They study the patterns of colors, studied as wavelengths of light, that they emit and absorb. This is possible because light interacts with different types of matter differently, producing a different **spectrum**, a collection of light waves or particles that occur in a particular order. Each element’s spectrum is unique, in the same way that every human has unique fingerprints.

The electrons of an element can absorb energy in the form of photons, allowing them to jump to higher energy levels. The particular number and value of the **photons** determine what wavelength of light is **absorbed**, thus creating a specific absorption spectrum unique to each element. Conversely, when an electron drops from a higher to a lower energy level, it emits a photon, that is a particle of energy appearing as light. The specific value of the photons released determines the **wavelength** of light that is given off. Since different types of matter contain electrons in varying numbers and positions, an **emission** spectrum containing a unique combination of wavelengths can be determined for each element.

Interestingly, the energy required to move electrons up to a particular level is the same amount released when electrons return to the original level. This means that each element’s emission spectra is directly **inverse** to its absorption spectra.

04 Research the spectrum of different elements. With a classmate, discuss the questions below.

- › What differences do you notice?
- › What similarities do the spectra have?
- › What do you think the similarities mean for the elements?



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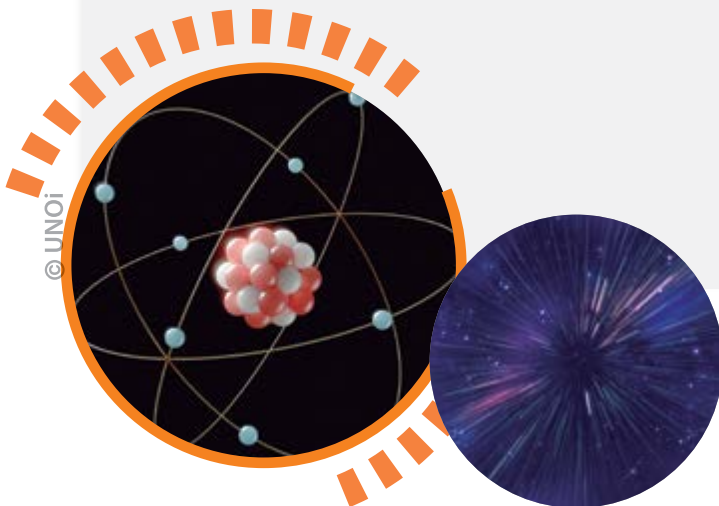
05 Match the sentence halves with the sentence pairs. With a classmate, discuss if the words in bold are nouns, adjectives, or verbs.

- | | |
|--|--|
| 1. Photons are emitted | a. occurs when electrons drop levels. |
| 2. The emission of photons | b. when electrons drop levels. |
| 3. The absorption of energy | c. allows electrons to jump. |
| 4. Energy is absorbed , | d. allowing electrons to jump. |
| 5. Differences in electron numbers | e. each element has a different spectrum. |
| 6. Due to the different electron numbers, | f. lead each element to have a different spectrum. |

07 Write a fact file about the emission and absorption spectrum.

06 Write the correct form of the word in parentheses to complete the sentence.

- Scientists now have the _____ to study wavelengths of light from the universe. (able)
- Alan's _____ led him to learn more about astronomy. (curious)
- The _____ of an anonymous donor allowed the university to build a new science wing. (generous)
- The astronomy professor at a prominent university got security _____ to go to NASA to share her findings. (clear)
- The _____ of supposed findings on the internet about life on other planets has been amusing. (emerge)
- Electron's feel an _____ to other electrons due to their electric charges. (attract)



08 With a classmate, design and deliver a presentation on the difference between emission and absorption spectra.