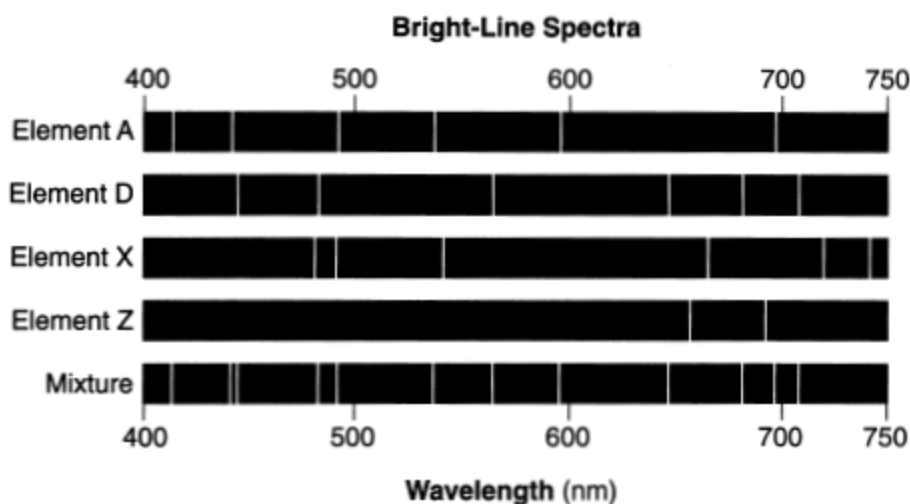


Bright line spectrum questions

Base your answers to questions 1 and 2 on the information below and on your knowledge of chemistry.

The bright-line spectra for four elements and a mixture of elements are shown in the diagram below.



1. Explain, in terms of electrons and energy states, how the light emitted by excited atoms is produced.
2. Write the letter of each element present in the mixture.

Base your answers to questions 3 through 5 on the information below and on your knowledge of chemistry.

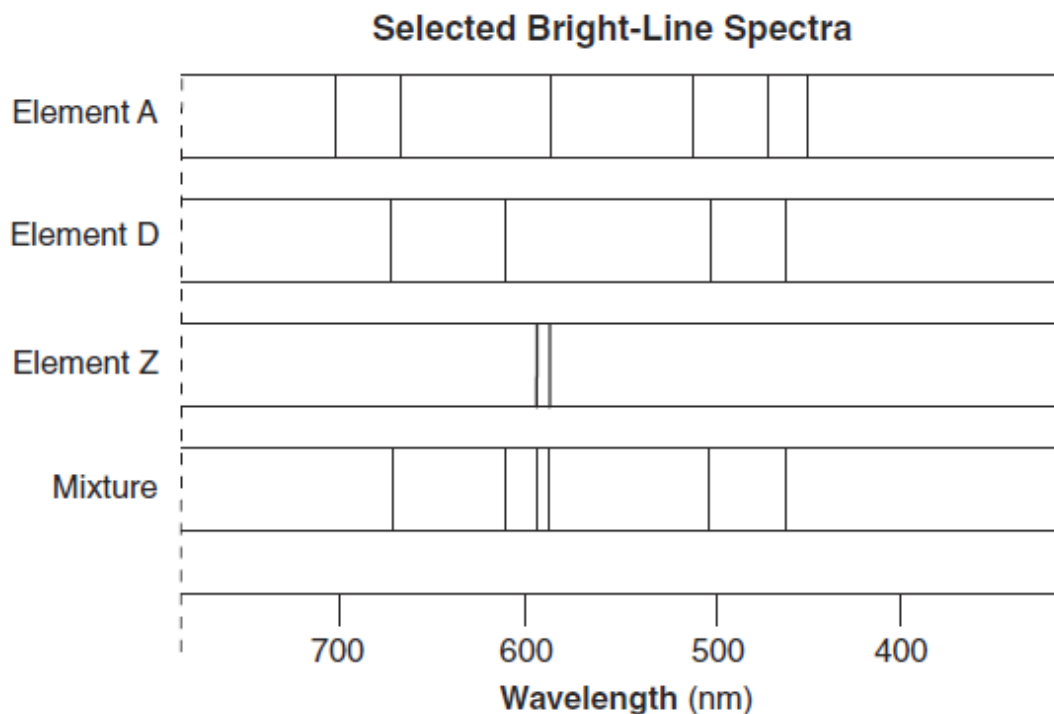
Fireworks that contain metallic salts such as sodium, strontium, and barium can generate bright colors. A technician investigates what colors are produced by the metallic salts by performing flame tests. During a flame test, a metallic salt is heated in the flame of a gas burner. Each metallic salt emits a characteristic colored light in the flame.

3. State how bright-line spectra viewed through a spectroscope can be used to identify the metal ions in the salts used in the flame tests.
 4. Explain, in terms of electrons, how a strontium salt emits colored light.
 5. Explain why the electron configuration of 2-7-1-1 represents a sodium atom in an excited state.
-

Bright line spectrum questions

Base your answers to questions 6 through 8 on the information below and on your knowledge of chemistry.

The bright-line spectra observed in a spectroscope for three elements and a mixture of two of these elements are represented in the diagram below.



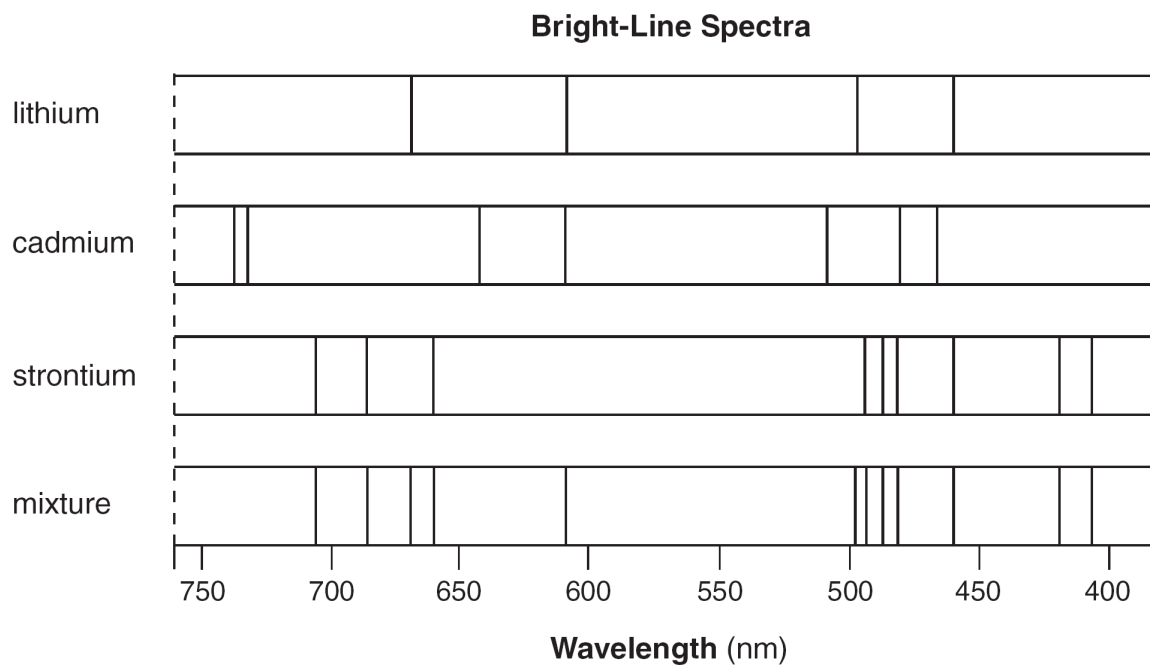
- Describe, in terms of *both* electrons and energy state, how the light represented by the spectral lines is produced.
- Explain why the spectrum produced by a 1-gram sample of element Z would have the same spectral lines at the same wavelengths as the spectrum produced by a 2-gram sample of element Z.
- State evidence from the bright-line spectra that indicates element *A* is *not* present in the mixture.

- Compare the energy of an electron in the first shell of a cadmium atom to the energy of an electron in the third shell of the same atom.

Bright line spectrum questions

Base your answers to questions **10** through **12** on the information below.

The bright-line spectra for three elements and a mixture of elements are shown below.



10 State the total number of valence electrons in a cadmium atom in the ground state.

11. Identify *all the elements in the mixture*.

12. Explain, in terms of *both electrons and energy*, how the bright-line spectrum of an element is produced.

Base your answers to questions **13** and **14** on the information below.

A glass tube is filled with hydrogen gas at low pressure. An electric current is passed through the gas, causing it to emit light. This light is passed through a prism to separate the light into the bright, colored lines of hydrogen's visible spectrum. Each colored line corresponds to a particular wavelength of light. One of hydrogen's spectral lines is red light with a wavelength of 656 nanometers.

Tubes filled with other gases produce different bright-line spectra that are characteristic of each kind of gas. These spectra have been observed and recorded.

13. Explain how the elements present on the surface of a star can be identified using bright-line spectra.

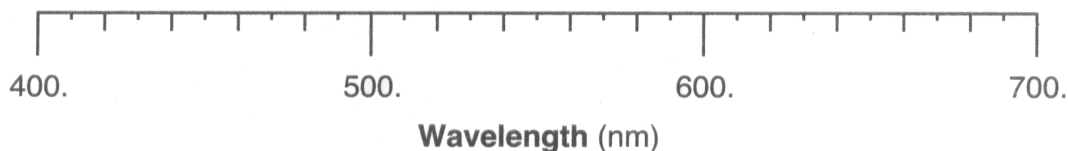
Bright line spectrum questions

14. Explain, in terms of electron energy states and energy changes, how hydrogen's bright-line spectrum is produced.

15. Base your answer to the following question on the information below

The Balmer series refers to the visible bright lines in the spectrum produced by hydrogen atoms. The color and wavelength of each line in this series are given in the table below.

Color	Wavelength (nm)
red	656.3
blue green	486.1
blue	434.1
violet	410.2



On the diagram above draw four vertical lines to represent the Balmer series.

Base your answers to questions 16 and 17 on the diagram below, which shows bright-line spectra of selected elements.

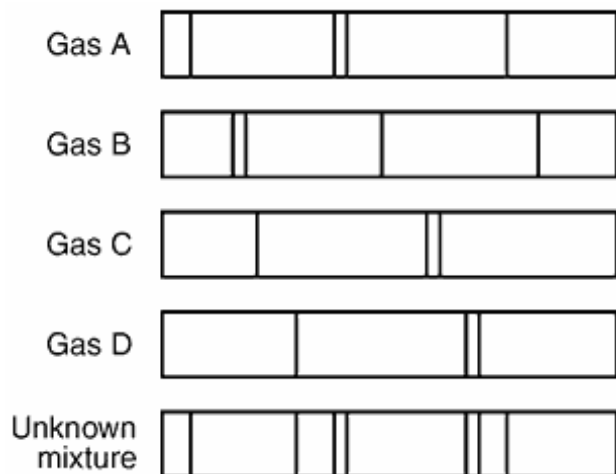


16. Explain how a bright-line spectrum is produced, in terms of *excited state*, *energy transitions*, and *ground state*.
17. Identify the *two* elements in the unknown spectrum.

Bright line spectrum questions

Base your answers to questions 18 and 19 on the information and the bright-line spectra represented below.

Many advertising signs depend on the production of light emissions from gas-filled glass tubes that are subjected to a high-voltage source. When light emissions are passed through a spectroscope, bright-line spectra are produced.



18. Explain the production of an emission spectrum in terms of the *energy states of an electron*.

19. Identify the *two* gases in the unknown mixture.

Bright line spectrum questions
