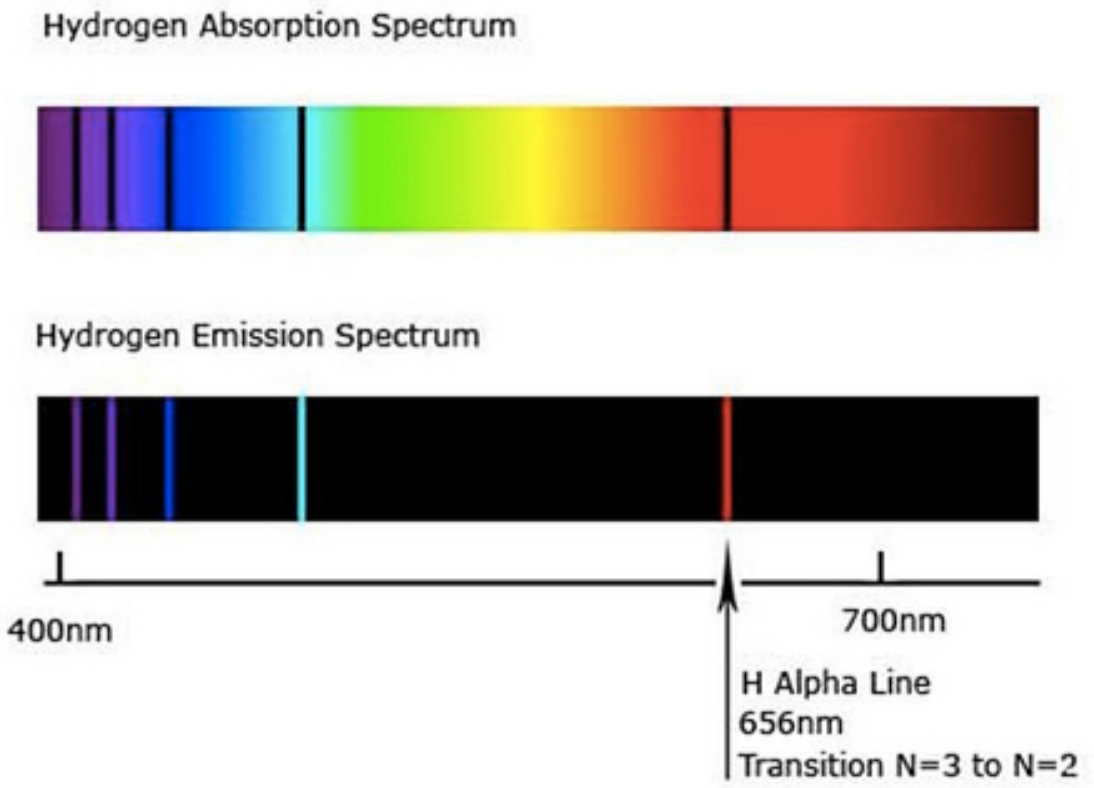
Classifying Stars from their Spectra



There are three types of spectrum you are likely to see when you look at a source of light through something that splits it up into its different colors (a prism, a spectrograph, or a diffraction grating like the one in rainbow glasses).

Continuous spectrum: All of the colors are there, like a rainbow. This is the light that something gives off when a solid, liquid, or high-pressure gas glows from its own heat (like lava).

Absorption spectrum: You can see a background rainbow, but it has some black lines across it where narrow chunks of certain colors are missing. This happens when you put a colder gas in front of a heat source, and it absorbs at a few characteristic colors based on what it is made out of.

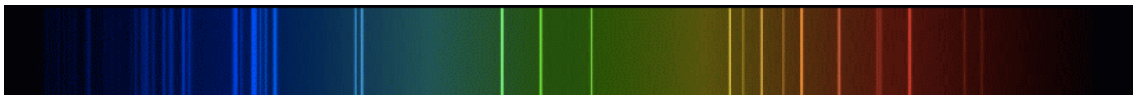
Emission spectrum: Now, so many chunks are missing that it hardly looks like a rainbow. You only see light coming from a few narrow bands of different colors. This happens when a low-pressure gas glows with its own heat (like a gas cloud).

Hydrogen

Helium

Lithium

Oxygen



Carbon

Nitrogen

Neon

Individual **elements** (types of atom), like the gas in a fluorescent light, give off light at just a few colors. This pattern of stripes is called **emission lines**, and is unique for each element, like a fingerprint.

Stars (like our sun!) show a continuous rainbow **spectrum** of light. However, different elements in each star can also show up as **absorption lines** or a dark pattern on top of that rainbow, like a barcode. These are the same lines that would show up as emission lines if you had a lightbulb filled with only that kind of gas.

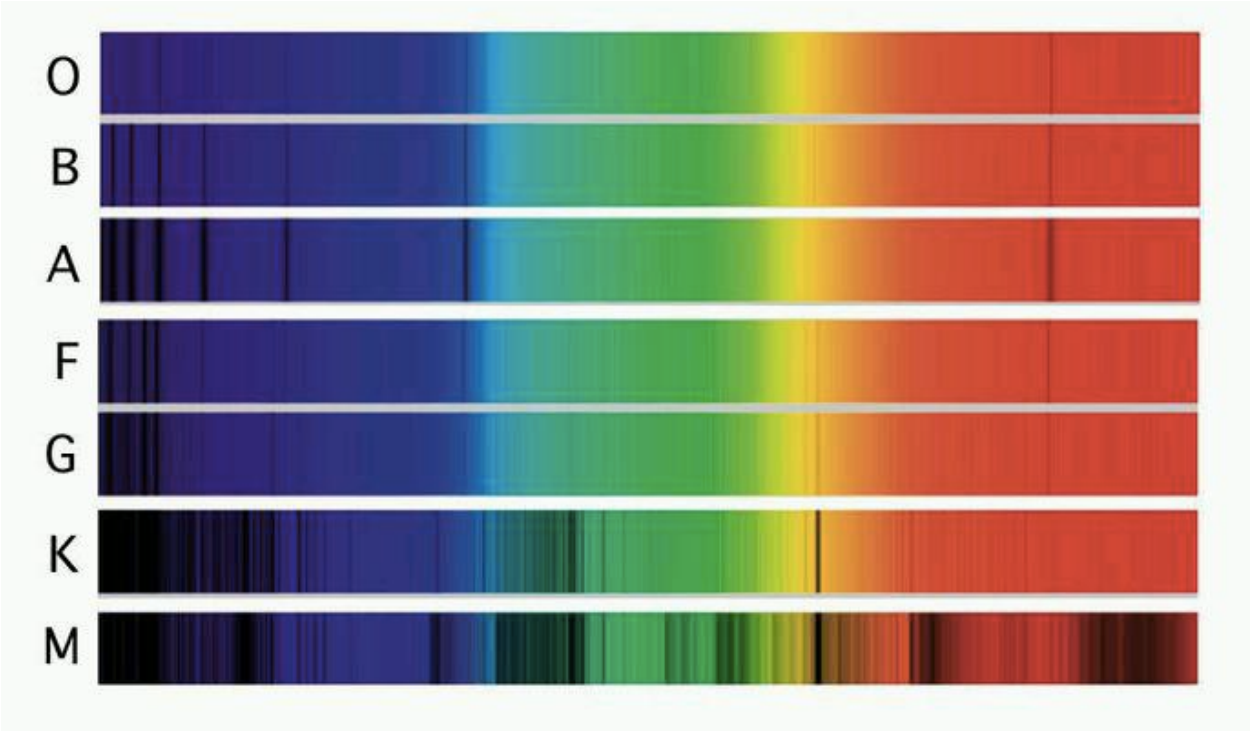
Can you match the barcode of absorption (dark) lines in the spectrum of this star to the emission (bright) lines from one of the elements above?

Mystery Star

I think the mystery star is made of _____

Because _____

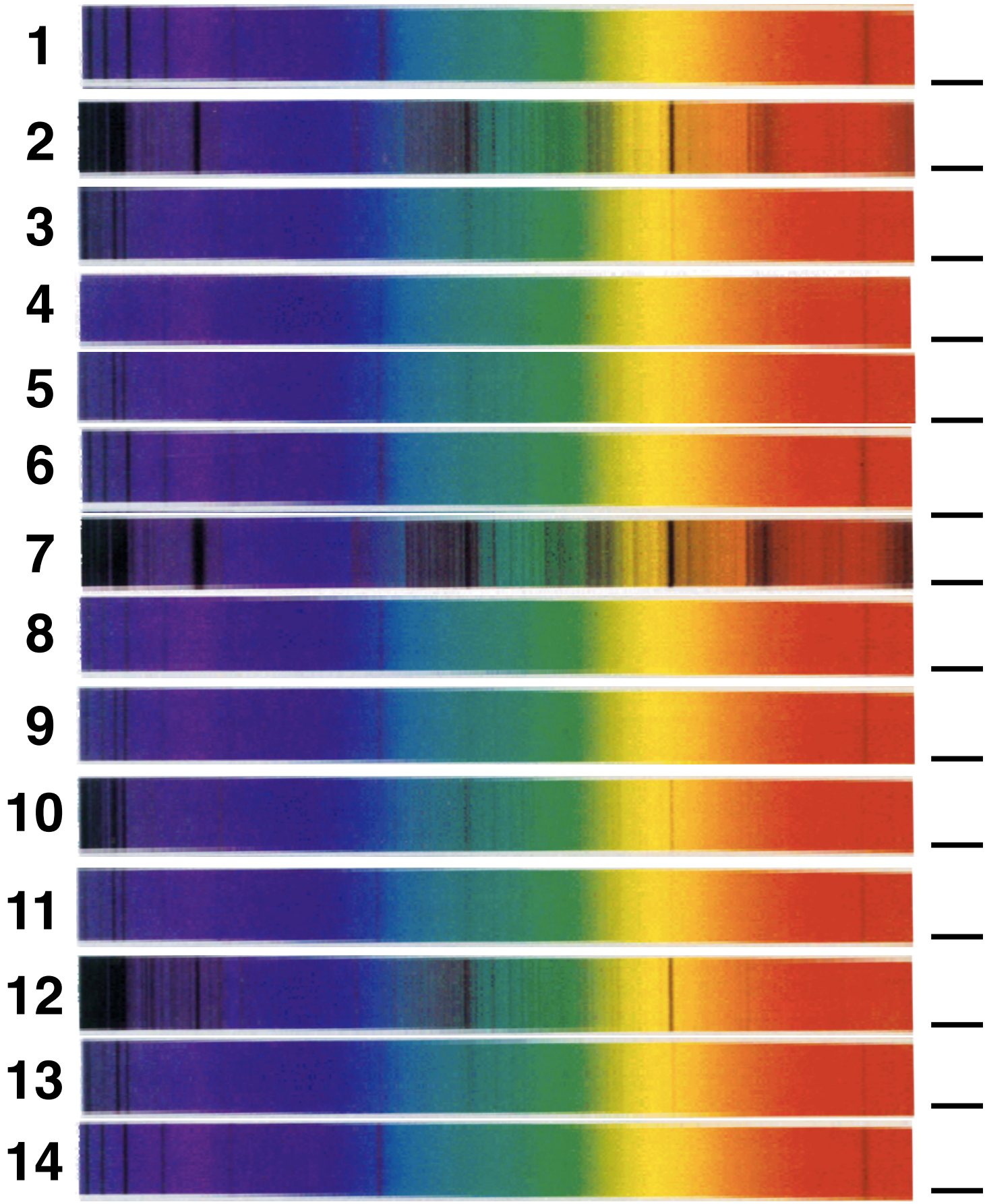
THE SPECTRAL SEQUENCE			
Class	**Spectrum**	**Color**	**Temperature**
O	ionized and neutral helium, weakened hydrogen	bluish	31,500-49,000 K
B	neutral helium, stronger hydrogen	blue-white	10,000-31,500 K
A	strong hydrogen, ionized metals	white	7500-10,000 K
F	weaker hydrogen, ionized metals	yellowish white	6000-7500 K
G	still weaker hydrogen, ionized and neutral metals	yellowish	5300-6000 K
K	weak hydrogen, neutral metals	orange	3800-5300 K
M	little or no hydrogen, neutral metals, molecules	reddish	2100-3800 K



Stars have a wide range of temperatures. Based on which elements absorb strongly at the temperature of a certain star, it will show a different pattern of absorption lines. The first astronomer to organize stars into different groups based on their spectrum was **Annie Jump Cannon**. She came up with the classification of stars that we use today, which group them into the letters **O B A F G K M** depending on their spectrum, which includes their **temperature** (color) and the pattern of absorption lines they show. Our sun is a 'G-type' star.

Use this system to classify the stars on the next page!

TYPE:



For each star (1-14), write 1-2 sentences describing the properties of its spectrum that you used to identify its type

1

2

3

4

5

6

7

8

9

10

11

12

13

14

Our sun is a ‘G’ type star. Which of these stars is of the same type, and how do its properties compare to the other stars?