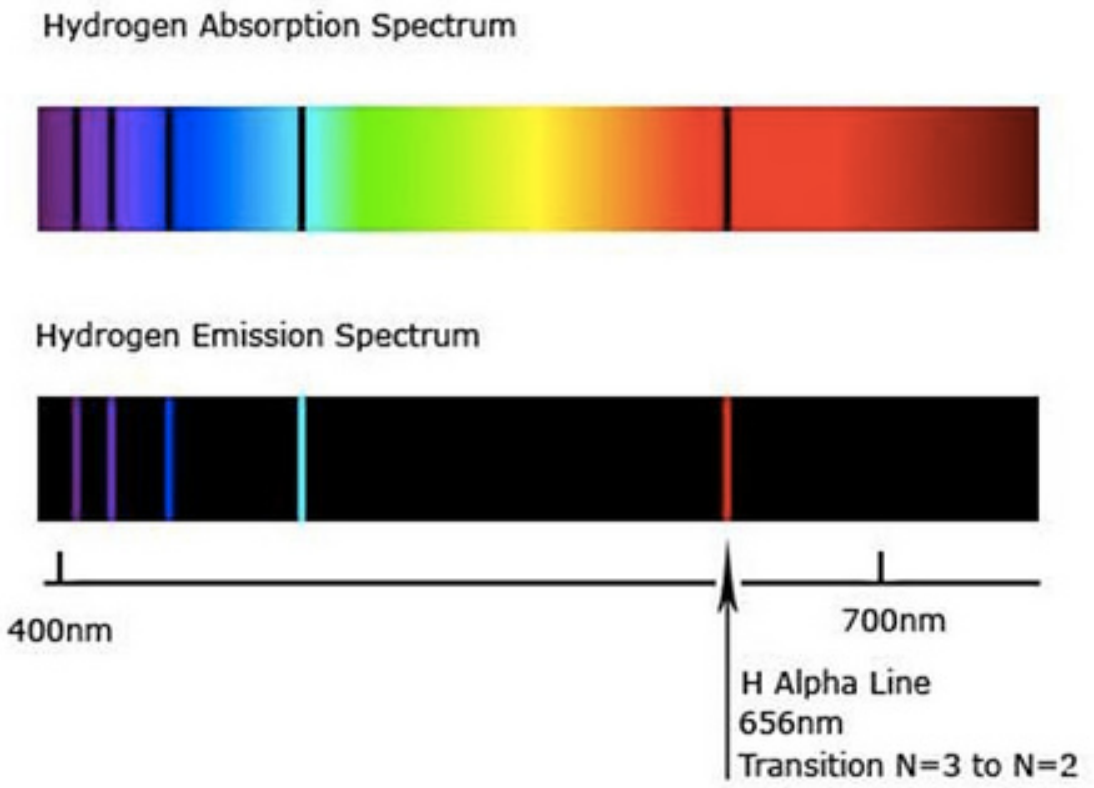
# Classifying Stars from their Spectra




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).

Stars (like our sun!) show a continuous rainbow **spectrum** of light. However, different elements in each star still show up as **absorption lines** or a dark pattern on top of that rainbow, like a barcode.

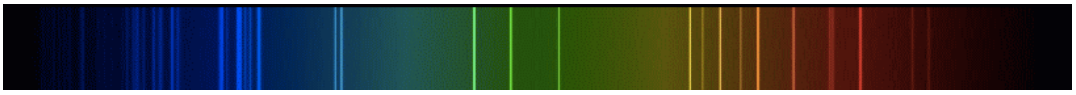
**Elements** (types of atom), like gas in a fluorescent light, give off light at just a few colors. This pattern of stripes is called **emission lines**, and is unique for each element, like a fingerprint.

Hydrogen

Helium

Lithium

Oxygen



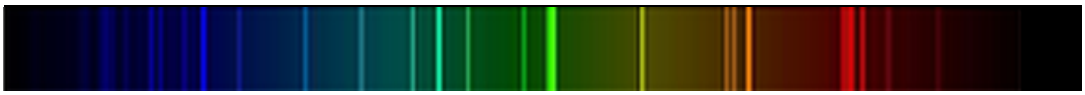
Carbon

Nitrogen

Sodium

Magnesium

Calcium

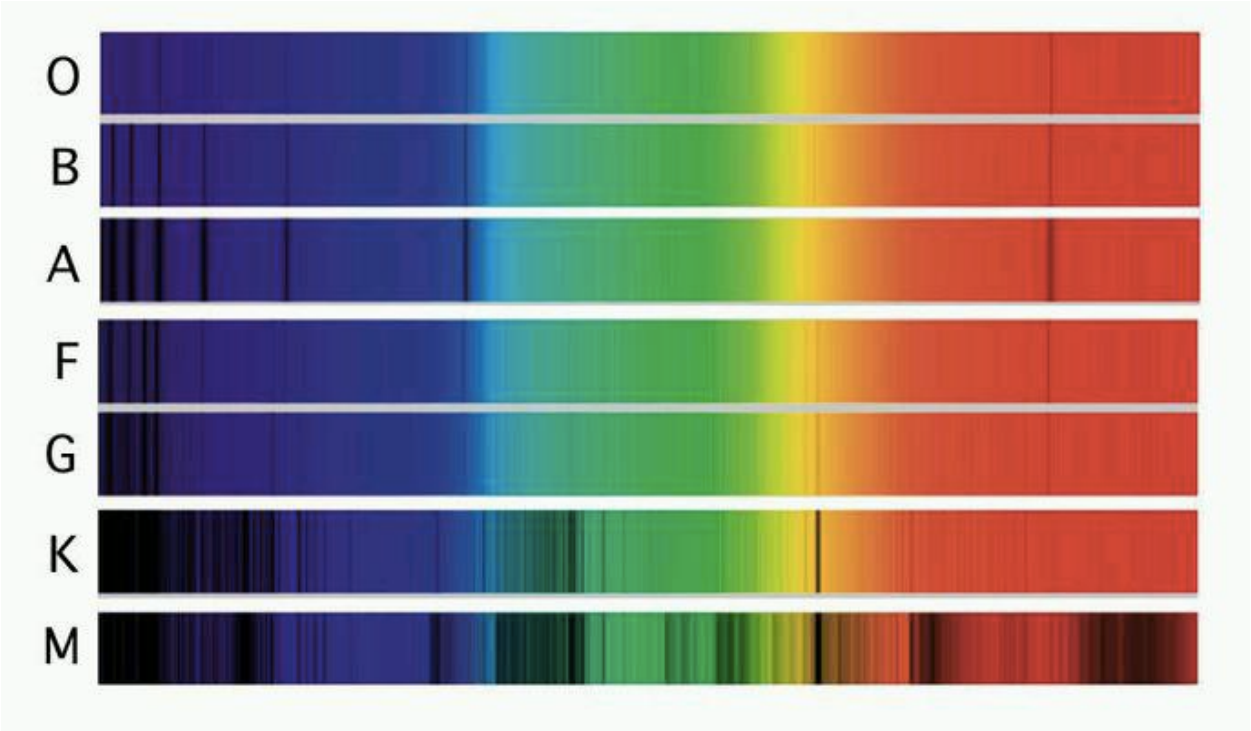


**Can you match the barcode of absorption (dark) lines in the spectrum of this star to the emission (bright) lines from one of the elements above?**

**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!

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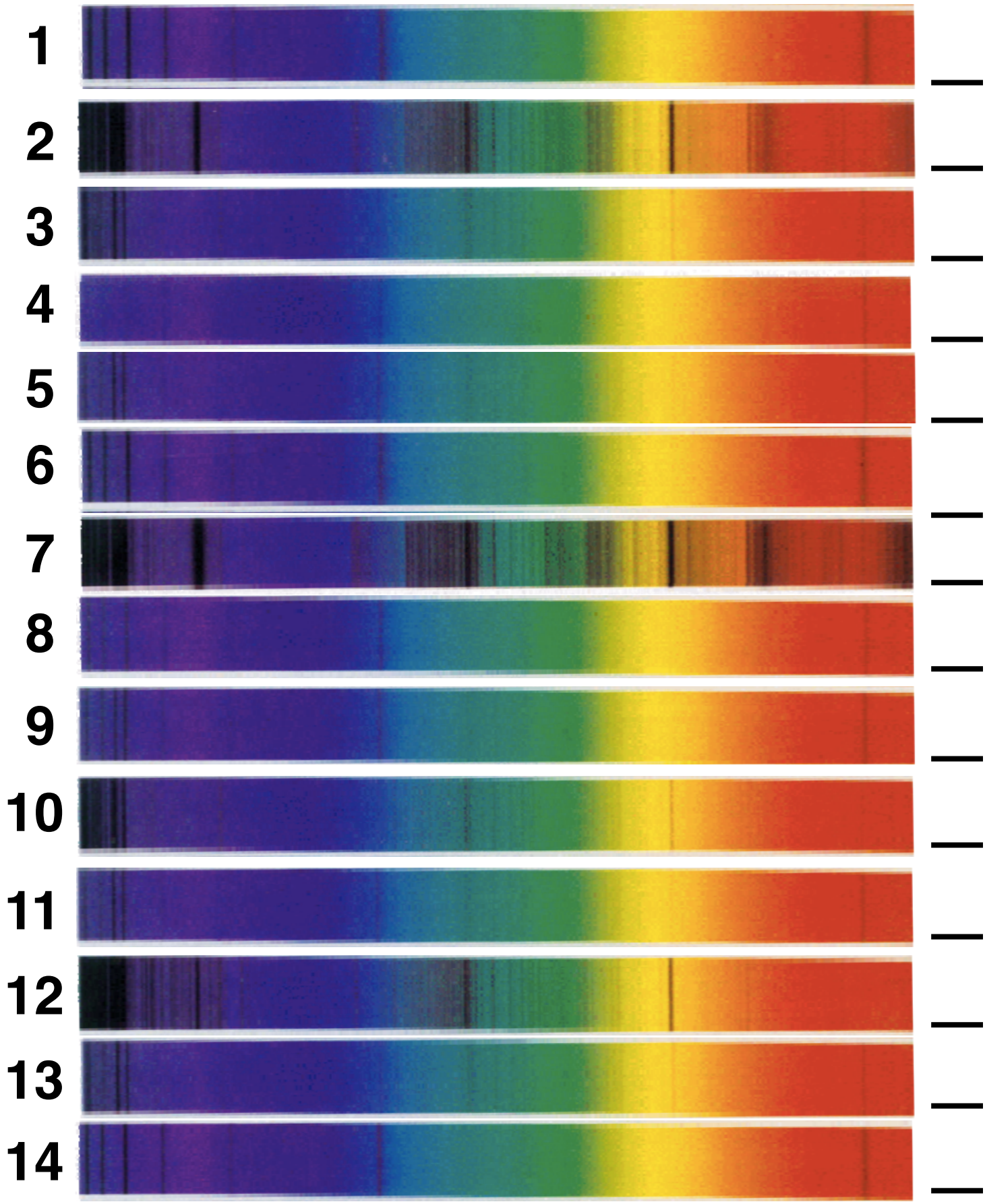

**For each star (1-14), write 1-2 sentences describing the properties of its spectrum that you used to identify its type**

**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?**