

Name _____ Period _____ Date _____

Worksheet: The 21-cm Line Concept Review

1. What is the most abundant element in the Milky Way?

2. A photon is a particle of light with a specific wavelength or frequency. Explain why a photon is emitted or absorbed when an electron undergoes a transition between energy levels.

3. Explain why the spectrum of an element acts as its signature.

4. If hydrogen is in its lowest electronic energy level and stays there, explain how it is possible for it to undergo a transition to a lower energy state and emit a photon.

5. What is the stationary wavelength of the red spectral line of hydrogen?

6. What happens to the wavelength of a spectral line if the source is moving?

7. What is the name physicists use to describe this type of shift?

8. What is the name astronomers use to describe this type of shift?

9. If the source is now moving *away from the observer*, then its signal will be stretched (lower frequency, longer wavelength). What is the color used to describe this type of shift?

10. In terms of its wavelength, describe the shift of a spectral line if the source is moving:
 - a. toward the observer

 - b. away from the observer