The formula for calculating radial speed is essay samples

Science, Physics

- In hydrogen the transition from level 2 to level 1 has a rest wavelength of 121. 6nm. Suppose you see this line at a wavelength of 120. 3nm in Star A, at 121. 1nm in Star B, at 121. 5nm in Star C and 122. 4nm in Star D. Which stars are coming towards us? Which are moving away? Which star is moving faster relative to us (either toward or away from)? Explain your answers.

In order to determine which star is coming towards us, which is moving away and which is moving faster despite whether is moving toward or away we calculate its radial speed from its Doppler effect. Another important thing to note is that, the wavelength of the line depends on the radial speed, the speed of moving away or towards us. When the radial speed is positive means the star is moving away from us a condition known as the redshift and when is negative it means the star is moving towards us , a condition termed as the blueshift.

[(Shifted Wavelength – Rest Wavelength) /Rest Wavelength] *Speed of light, where the speed of light is 3*105 km/s.

For Stars A, Radial Speed = (-1. 3/121. 6) *3*105= -3207 km/s.

For Star B, Radial Speed = (-0. 5/121. 6)*3*105= -1234 km/s.

For Star C, Radial Speed = (-0. 1/121. 6) *3*105= -247 km/s.

For Star D, Radial Speed = (0. 8/121. 6) *3*105= 1974 km/s.

Now we can go ahead and conclude that stars A, B and C are moving towards us since their radial speed is negative. Star D is moving away because it has a positive radial speed. Star A has a radial speed of -3207km/s and is the star that is moving faster.

- Explain how studying an object’s spectrum can allow us to determine each of the following properties of the object:

The object surface chemical composition

The object surface temperature

According to Wien’s law one of the characteristic of an object’s spectrum is its peak wavelength which provides us with information about temperature. Radiant distribution and wavelength has a peak wavelength that depends on temperature. So the shorter the peak wavelength the higher the object’s temperature and the longer the peak wavelength the lower the object’s temperature.

Whether the object is a low density cloud of gas or something more substantial

When an object has a low density, it has a longer optical depth, so most radiant come from places far from the object. As a result more light is absorbed which make the atomic particles of the object stronger hence the low density. If its substantial the optical depth is normally short, so most radiant come from places near the object and as a result the object absorb less radiant making the atomic particles weaker hence high density.

The speed at which the object is moving towards or away from us

The speed of approach or recession can only be calculated from the Doppler shift equations. If the radial speed is negative then it’s moving towards us and if positive its moving away.