Doppler shift worksheet

A source of sound (say, an ambulance) approaches you with the speed of 100 m/s. Compared to the stationary values:

the frequency will be _____, the wavelength will be _____
(lower, higher, the same) (shorter, longer, the same)

A source of sound (say, an ambulance) recedes from you with the speed of 100 m/s. Compared to the stationary values:

the frequency will be _____, the wavelength will be _____
(lower, higher, the same) (shorter, longer, the same)

A source of sound (say, an ambulance) is moving in parallel with you with the speed of 100 m/s. Compared to the stationary values:

the frequency will be _____, the wavelength will be _____
(lower, higher, the same) (shorter, longer, the same)

Explain in words what that means in terms of "pitch" – i.e., how will you hear that source of sound depending on whether it moves away from you or towards you.

_____

_____

_____

_____

Now substitute sound for light.

A source of light (say, a star) approaches you with the speed of 100 km/s. Compared to the stationary values:

the frequency will be _____, the wavelength will be _____
(lower, higher, the same) (shorter, longer, the same)

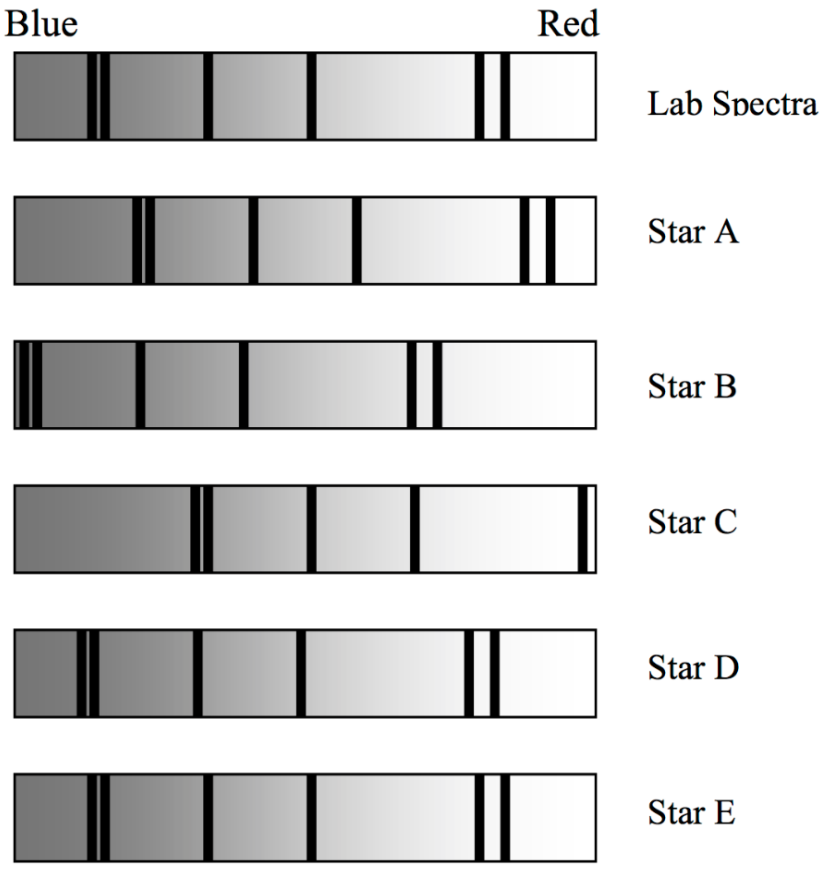
A source of light (say, a star) recedes from you with the speed of 100 km/s. Compared to the stationary values:

the frequency will be _____, the wavelength will be _____
(lower, higher, the same) (shorter, longer, the same)

A source of light (say, a star) is moving in parallel with you with the speed of 100 km/s. Compared to the stationary values:

the frequency will be _____, the wavelength will be _____
(lower, higher, the same) (shorter, longer, the same)

Take a detailed look at the spectra below.



The top spectrum is a reference spectrum, i.e. a spectrum of a stationary source.

Which stars are receding from us: _____

Which stars are approaching us: _____

Which stars are not moving towards/away from us: _____

Could such stars still be moving with respect to us? Explain.

_____

_____