

Astronomy 102: Assignment 1, atoms, starlight and the Sun

1. Describe what we mean by the wavelength of light (use a diagram to help you with your answer). What units do astronomers usually use to measure wavelengths? What is the approximate range of wavelengths that our eye is sensitive to (with units)? Arrange the following parts of the electromagnetic spectrum in order of lowest *energy* to highest *energy*: infra-red, gamma-rays, ultra-violet, radio. [6]
2. What is the difference between transverse and radial velocity (use a diagram)? Which do we measure in the Doppler effect? As you approach a stationary policeman on the side of the road, does his radar gun measure a blueshift or a redshift? Does this correspond to a longer or shorter wavelength (as observed by the policeman)? Does the measured shift change the closer you get to the policeman? [6]
3. Describe the two techniques that can be used to estimate the temperature of a star. What is the approximate temperature of the Sun a) on the surface and b) in the corona? [6]
4. Draw a butterfly diagram and explain its pattern. Approximately how big is a sunspot? [6]
5. Why do nuclear fusion reactions require very high temperatures? How much energy is released when the sun converts 50 kg of hydrogen to helium? How many megaton bombs is that (1 MT bomb = 4×10^{15} J)? (mass defect is 0.007). What mass of Helium is made? [6]

Total: 30.