AP 2 Atomic Line Spectra and Energy levels ws 1

1. Which energies below indicate that the electron is attached to an atom?

-1 eV 0 eV 18 eV -8.6 eV

- 2. For each of the following energies, indicate how much energy you must add to get the electron free from the atom: a) -3.4 eV; b) -54.4 eV; c) -11.5 eV.
- 3. An electron has an energy of -4.6 eV. An interaction occurs and it loses 5.1 eV of energy. a) What is its new energy? b) Is it still attached to the atom? Explain your answer.



5. The silicon-silicon single bond that forms the basis of a (mythical) silicon-based creature, the Horta, has a bond strength of 3.4 eV. What wavelength photon would you need in a (mythical) phaser disintegration gun to destroy the Horta?

- 6. An atom that is initially in an energy level with E=-8.92 eV absorbs a photon that has a wavelength 735 nm. What is the internal energy of the atom after it absorbs the photon?
- An atom that is initially in an energy level with E=-1.35 eV emits a photon that has wavelength 360 nm. What is the internal energy of the atom after it emits the photon?
- 8. An unknown element his found to have a spectrum for absorption from its ground level with lines at 3.0, 7.0, and 9.0 eV, and its ionization energy is 10.0 eV. a) Draw an energy-level diagram for this element. b) if an 9.0 eV photon is absorbed, what energies can the subsequently emitted photons have?

9. Stars have strong hydrogen spectral lines. Often, however, the typical hydrogen spectral pattern is found displaced to one side of the spectra so that the violet line is blue. When a sound source comes toward you, the wavelength is "squished" so that it becomes smaller and the sound has a higher pitch. When the source moves away, the pitch is lower as the wavelength becomes longer. You may remember hearing this effect, called the Doppler shift, when cars go by you. An analogous shift occurs when light sources move toward or away from the observer. When the hydrogen lines are "red shifted" is the star moving toward or away from you? Explain your answer.