

Tareas 9 Tópicos de la Física Moderna

Martes, 3 de Noviembre 2020

1. Why don't two helium atoms bond together to make a molecule like H_2 , N_2 , or O_2 ?
2. An experimenter provides 4.5 eV of energy in order to dissociate an H_2 molecule into two H atoms. Where has the energy gone?
3. (a) The binding energy of each of the hydrogen atoms in CH_4 is nearly identical: 4.5 eV for $H - CH_3$, 4.8 eV for $H - CH_2$, 4.4 eV for $H - CH$, 3.5 eV for $H - C$. Why is this true? (b) Hydrogen and carbon atoms are combined to make 1 kg of methane. Calculate the mass of the uncombined atoms.
4. The ionization energy of lithium is 4.3 eV and the electron affinity of fluorine is 3.4 eV. The bond length of the LiF molecule is 0.16 nm. Make an estimate of the molecular binding energy.
5. Why is more energy required to induce a vibrational molecular excitation than to induce a rotational excitation?
6. The vibrational frequency of the CO molecule is $6.42 \cdot 10^{13}$ Hz. Estimate the amplitude of the molecular vibrations. Compare your answer to the bond length.
7. For hydrogen gas at room temperature, make an estimate of the fraction of molecules that are in the first vibrational state.
8. Why does the removal of an electron from a molecular bonding orbital by photoabsorption cause the molecular ion to be left in an excited vibrational state?
9. The CO molecule absorbs radiation at a wavelength of 0.652 mm. What transition is taking place?