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Physics_Questions_0011

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- 1.) Many bonds between atoms result from the attraction of positively and negatively charged atoms. Based on the electrical charges and separations, which of the following atomic bonds is strongest? [Hint: You are interested only in the relative strengths, which depend only on the relative charges and distances.]
 - a. a +1 sodium atom separated by 2.0 distance units from a -1 chlorine atom in table salt
 - b. a +1 hydrogen atom separated by 1.0 distance unit from a -2 oxygen atom in water
 - c. a +4 silicon atom separated by 1.5 distance units from a -2 oxygen atom in glass

- 2.) Estimate the largest force that you can exert without mechanical aids. How would you exert this force? (My weight = 125 lbs.)

- 3.) The Ocean Thermal Electric Conversion system (OTEC) is a kind of a high-tech electric generator. It takes advantage of the fact that in the tropics, deep ocean water is at a temperature of 4°C, while the surface is at a temperature around 25°C. The idea is to find a material that boils between these temperatures. The material in fluid form is brought up through a large pipe from the depths, and the expansion associated with its boiling is used to drive an electric turbine. The gas is then pumped back to the depths, where it condenses back to a liquid and the whole process repeats.
 - a. What is the maximum efficiency with which OTEC can produce electricity? [Hint: Remember to convert all temperatures to the Kelvin scale.]

 - b. Why do you suppose engineers are willing to pursue the scheme, given your answer in a?

 - c. What is the ultimate source of the energy generated by OTEC?

- 4.) An organ pipe is 1.8 meters long. What is the frequency of the sound it produces? To what pitch does that frequency correspond?

- 5.) Radio and TV transmissions are being emitted into space, so Star Trek episodes are streaming out into the universe. The nearest star is 9.5×10^{17} meters away. If civilized life exists on a planet near this star, how long will they have to wait for the next episode?