

Name: _____ Date: _____
AP Chemistry – Mr. McKnight – Per. _____
Chapter 5 Atomic Theory Worksheet

- At its closest approach, Mars is 56 million km from Earth. How long would it take to send a radio message from a space probe on Mars to Earth when the planets are at this closest distance?
- The second is defined as the time it takes for 9,192,631,770 wavelengths of a certain transition of the cesium-133 atom to pass a fixed point. What is
 - the frequency of this electromagnetic radiation?
 - its wavelength?
- The energy required to dissociate the Cl_2 molecule to Cl atoms is 239kJ/mol Cl_2 . If the dissociation of a Cl_2 molecule were accomplished by the absorption of a single photon whose energy was exactly the quantity required, what would be its wavelength (in meters)?
- In the stratosphere, ultraviolet radiation with a frequency of $1.36 \times 10^{15} \text{ s}^{-1}$ can break C-Cl bonds in chlorofluorocarbons (CFCs), which can lead to stratospheric ozone depletion. Calculate the energy per quantum of this radiation.
- Four possible electron transitions in a hydrogen atom are given below:

	n_{initial}	n_{final}
(1)	2	5
(2)	5	3
(3)	7	2
(4)	4	6

 - Which transition(s) represent a loss of energy?
 - For which transition does the atom gain the greatest quantity of energy?
 - Which transition corresponds to emission of the greatest quantity of energy?
- Li^{2+} is a hydrogen-like ion. Such an ion has a nucleus of charge $+Ze$ and a single electron outside this nucleus. The energy levels of the ion are $-Z^2R_H/n^2$, where Z is the atomic number. What is the wavelength of the transition from $n = 5$ to $n = 3$ for Li^{2+} ? In what region of the spectrum does this emission occur?
- The term degeneracy means the number of different quantum states of an atom or molecule having the same energy. For example, the degeneracy of the $n = 2$ level of the hydrogen atom is 4 (a 2s quantum state and the three different 2p states). What is the degeneracy of the $n = 5$ level?