REVIEW QUESTIONS
Chapter 7

1. Calculate the wavelength and energy of a photon of radiation with frequency of $2.85 \times 10^{12}\ s^{-1}$.

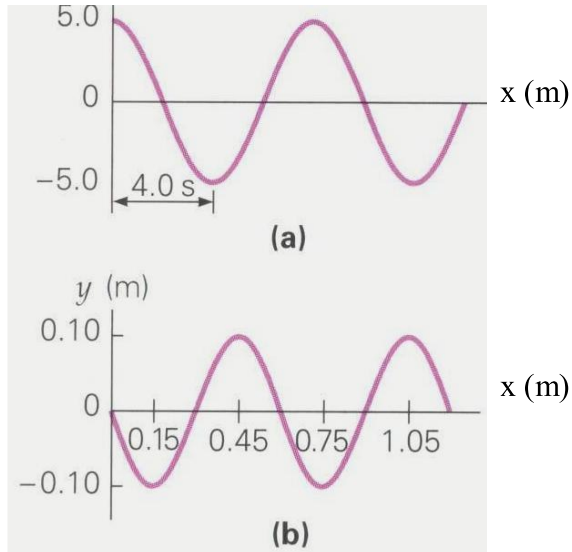
2. What is the wavelength of radiation with energy of 8.23×10^{-19} J? In what region of the electromagnetic spectrum would this radiation be found?

3. For each of the following transitions in the hydrogen atom, calculate the energy, wavelength and frequency of the associated radiation and determine whether radiation is absorbed or emitted during the transition.

   a) from n=5 to n=1

   b) from n=2 to n=7

4. Use the diagrams below to determine the wavelength and frequency of each wave shown. (Assume the same time and distance scale for both waves)



5. The energy needed to remove an electron completely from an atom is called its *ionization energy*. In terms of Bohr's model, ionization can be considered a process in which the electron moves to an "orbit" of infinite radius. The ionization of a ground-state hydrogen atom can therefore be calculated by assuming that the electron undergoes a transition from $n_i=1$ state to $n_f=\infty$ state. Calculate this energy in kJ/mol.

6. Determine if each set of quantum numbers below is permissible or not. If yes, write the orbital designation for each.

a)	n= 2	l=1	m_l= +1
b)	n= 1	l=0	m_l= –1
c)	n= 4	l= 2	m_l= +1
d)	n= 3	l= 3	m_l= 0

7. Write the quantum numbers associated with each of the following orbitals:

a)	4p	n=	l=	m_l=
b)	3d	n=	l=	m_l=
c)	7s	n=	l=	m_l=
d)	5f	n=	l=	m_l=

8. The quantum numbers listed below are for four different orbitals. List them in order of increasing energy. Indicate whether any two have the same energy.

a)	n= 4	l= 0	m_l= 0
b)	n= 3	l= 2	m_l= +1
c)	n= 3	l= 1	m_l= –1
d)	n= 3	l= 2	m_l= 0

9. Rank the following orbitals in increasing order of energy:

4d 3p 6s 5p 4f

10. How many orbitals are possible with each of the following designations:

a) 2p ________

b) 5s ________

c) 3d ________

d) 4f ________

11. When a compound containing cesium is heated in a Bunsen burner flame, photons with energy of 4.30×10^{-19} J are emitted. What color is the cesium flame?

12. The He^{+} ion contains one electron and is therefore a hydrogen-like ion. Calculate the wavelength of the first four electron transitions (6→2, 5→2, 4→2 and 3→2) for this ion and compare with the same transitions in the H atom. Comment on the differences. (R_H for He^{+}=8.72×10^{-18} J)