General information about the electromagnetic spectrum and Chapter 6

1. Fill in the blank with the appropriate answer,
   a) Electro magnetic energy with a short lately has a (high/low)frequency.
   Answer_____

   b) Electromagnetic energy with a short lately has a (high/low! energy.
   c) Answer_____

   d) Term for a packet of electromagnetic radiation is (futon/photon/proton)
   Answer_____

   e) Energy is (absorbed/released) when electrons move from the excited state to the ground state. Answer_____

   f) Which color of visible light has the lowest energy?
   Answer_____

   g) Which light has less more energy than green light?
   Answer_____

   h) Radio waves can be heard by the human ear(true/false)?
   Answer_____

   i) What type of radiation has a wavelength just slightly longer than red light?
   Answer_____

   j) The term for the distance between 2 consecutive peaks in a wave is:
   Answer_____

   k) The portion of electromagnetic radiation with the wavelength approximately 400 to 700 nm is: Answer_____

   l) Lowest possible energy state of an atom is:
   Answer_____

   m) According to Bohr, an electron in the Hydrogen atom moves around the nucleus in circular paths called: Answer_____

n) Modern atomic theory describes the region in space with a high probability of finding an electron is an:
Answer_____

o) What term means only certain values of energy are allowed?
Answer_____

p) Which type of light produces a continuous spectrum?
Answer_____

q) Do any 2 electrons produce the same line spectrum?
Answer_____

2) Complete the calculations:

a) Calculate the frequency of light that has a wavelength of 75.0 nm. What type of radiation is this?

b) A photon of visible light has a energy of 3.4×10^{-19}J. What is the wavelength of this light? What is the frequency of the light? What region of the EM spectrum would one find this light?

c) Calculate the energy of a photon that has a frequency of 2.5 THz.

Rydberg equation calculations:

1. Calculate the wavelength of EM radiation emitted when an electron returns from an excited state of n = 3 to the grounds state of n= 1.

2. A ^{1}H atom in its ground state (n = 1) absorbs EM radiation with a wavelength of 1.026×10^{-7} m. Calculate the energy level of the resulting excited state (n_f = ?).

3. Calculate the wavelength of EM radiation absorbed when an electron is excited from n = 3 to n = 7.

Photo electric effect

1. For biological organisms, most damage is done to cells by standing in front of a very weak, low power, been x-rays done in front of a much brighter red light. Use the photoelectric effect to explain your answer.

2. What is the lowest frequency of light that can cause the release of electrons from a metal that has a work function of 2.8 eV? 1 eV = $1.6099X10^{-19}$J

3. In studying a solid material for possible use in a solar cell (which turns light into electrical energy), material engineers shine a monochromatic blue light (λ = 420 nm) to produce photoelectrons. They measure the maximum kinetic energy of the emitted electrons to be 1.00×10^{-19} J. Predict what will happen when the engineers test the material with red light (λ = 700 nm). Will the light dislodge electrons from the material? If so, how much kinetic energy will those dislodged electrons have?

4. Gold has a work function of 4.82 eV. A block of gold is illuminated with ultraviolet light (λ = 160 nm).Find the maximum kinetic energy of the emitted photoelectrons in electron volts. Find the threshold frequency for gold

5. Sodium and silver have work functions of 2.46 eV and 4.73 eV, respectively.

a) If the surfaces of both metal are illuminated with the same monochromatic light, which metal will give off photoelectrons with greater speed? How much faster will those photoelectrons be?

b) What is the cutoff wavelength for each material.

Quantum number practice:

1. What are the 14 sets of quantum numbers that describe the 14 electrons of silicon?

2. The quantum numbers listed below are for 4 different electrons in the same atom. List them by order of increasing energy.

n=4, l=0, m_l=0, m_s=1/2			Least energy
n=3, l=2,m_l=1, m_s=1/2			
n-3, l=2, m_l= -1, m_s= 1/2			
n=3, l= 1, m_l= 1, m_s = ½			Highest enegyr

Do any have the same energy?
Which ones?

3. What is the subshell designation (2p, for example) for the following values?
   a) n=2, l=0
   b) n=4, l=3
   c) n=5, l=1
   d) n=3, l=-0
   e) n=6, l=4
   f) n=5, l=2

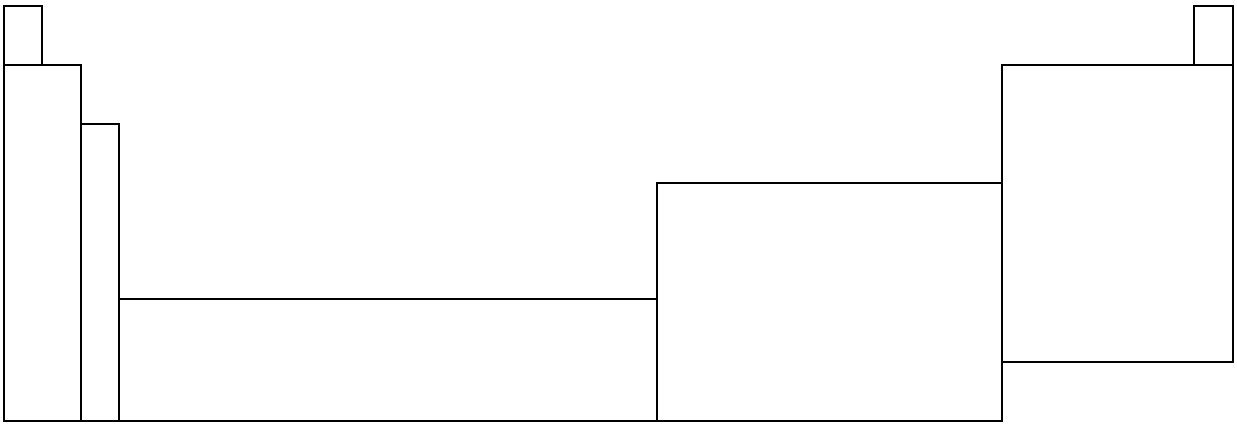
4. What are the maximum number of electrons in an atom Atom that can have as part of their set of four quantum numbers for each of the following

   a) n= 3,
   b) n = 4, l = 2,
   c) n=3, l = 3 = -1
   d) n= 7, l = 4, ml=3, m_s=1/2
   e) n= 5. l=6, m_l=0

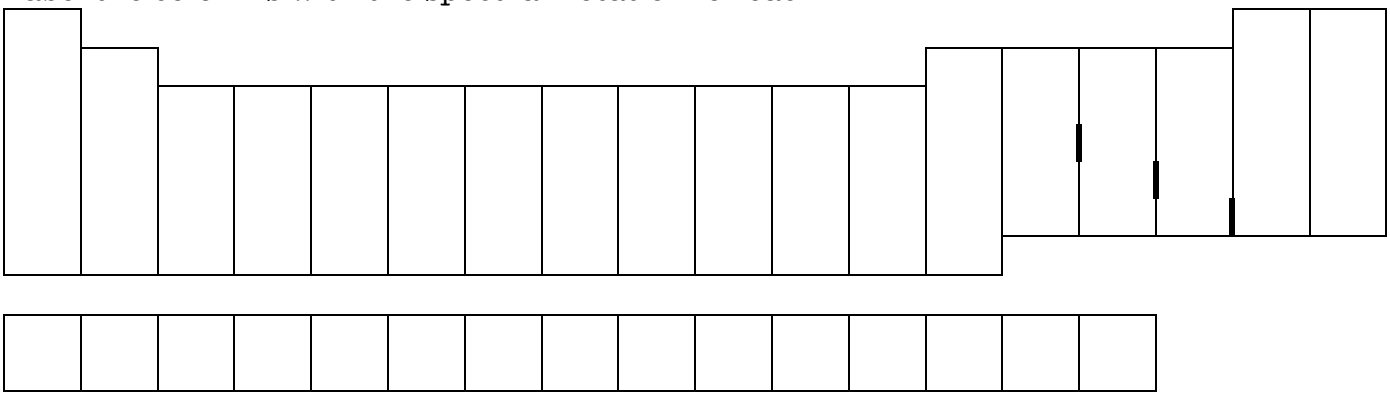
5. Sketch or use words to describe the general shape of the orbitals that have the following sets of quantum numbers:
   a) 0,0,1
   b) 2,1,1
   c) 3,2,2

Electron configurations and the periodic table

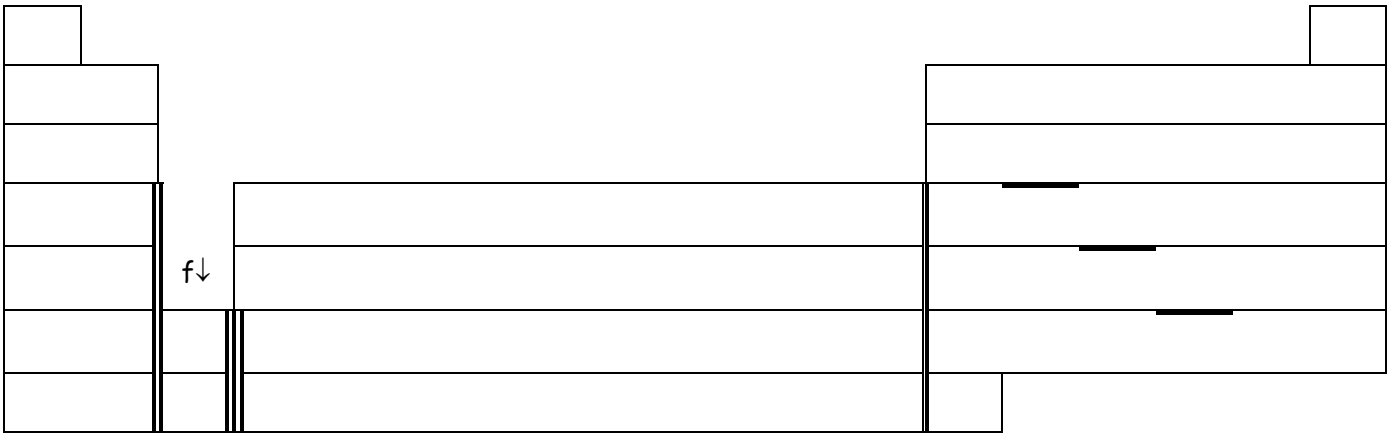
Fill in the blocks

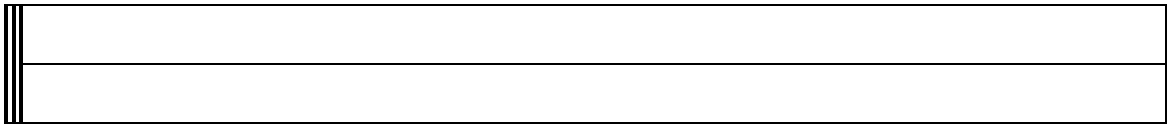


Label the columns with the spectral notation for each



Fill in the periodic table below with the appropriate periods and sublevels





Fill in the table with the appropriate information for the following elements

Symbol	e-config.	Noble gas config.
Rb		
Ba		
Ti		
Mo		
Si		
Pb		
Cl		

Fill in the table with the appropriate information

Symbol	Block of last e in	Period of last e in	Notation of last fill sublevel	Group No.	No. Valence e
Rb					
Ba					
Ti					
Mo					
Si					
Pb					
Cl					

Shade in the 6 elements that do not follow AufBau

Sc	Ti	V	Cr	Mo	Fe	Co	Ni	Cu	Zn
Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ab	Cd
Lu	Hf	Ta	W	Re	Is	Ir	Pt	Au	Hg

Write the electron configuration for the elements in the 4^{th} period that do not obey Aufbau.