CHM 151 Worksheet Spring 2007 Name: Key

You may work together on this worksheet.

What is the wavelength of radiation that has a frequency of $6.912 \times 10^{14}\ s^{-1}$?

$c = \lambda \nu \qquad \lambda = \frac{c}{\nu} \qquad \lambda = \frac{3.00\times10^{8}\ m/s}{6.912\times10^{14}\ s^{-1}} = 4.34\times10^{-7}\ m$

Calculate the frequency of visible light having a wavelength of 486.1 nm.

$\nu = \frac{c}{\lambda} \qquad \frac{3.00\times10^{8}\ m/s}{486.1\times10^{-9}\ m} = 6.172\times10^{14}\ s^{-1}$

What is the energy in joules of one photon of microwave radiation with a wavelength 0.122 m?

$E = h\nu \quad \nu = \frac{c}{\lambda} \qquad E = \frac{hc}{\lambda} = \frac{6.626\times10^{-34}\ J\cdot s \,|\, 3.00\times10^{8}\ m/s}{0.122\ m} = 1.63\times10^{-24}\ J$

Calculate the energy, in joules, required to excite a hydrogen atom by causing an electronic transition from the n = 1 to the n = 4 principal energy level. Recall that the energy levels of the H atom are given by $E = -2.18 \times 10^{-18}\ J(1/n_2)$

$E_I = -2.18\times10^{-18}\left(\frac{1}{1^2}\right) = -2.18\times10^{-18}$

$E_F = -2.18\times10^{-18}\left(\frac{1}{4^2}\right) = -1.363\times10^{-19}$

$E_F - E_I = \Delta E = 2.04\times10^{-18}\ J$

The number of orbitals in a d subshell is 5 and the maximum number of electrons in a d subshell is 10.

The electron configuration of a vanadium (V) atom is $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^3$

How many valence electrons does a tin (Sn) atom have? 4 ?

Which of the following make an isoelectronic pair: Cl^-, O^{2-}, F, Ca^{2+}, Fe^{3+}? Cl^- + Ca^{2+} ?

Write out the electron configuration of a sulfide ion, S^{2-}? [Ar] or $1s^2 2s^2 2p^6 3s^2 3p^6$

Write out the electron configuration of a Co^{3+} ion? $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6$.

Arrange the following ions in order of increasing ionic radius, K^+, P^{3-}, S^{2-}, Cl^-.

Smallest K^+ Cl^- S^{2-} P^{3-} Largest.

Which of the elements listed below will have the greatest ionization energy? Cs, Ga, K, Bi, **As**

Which one of the following elements should have the smallest ionization energy? Cl, Na, Be, **K**, As

Which element will display an unusually large jump in ionization energy values between I3 and I4, its third fourth ionization energies? Na, Mg, **Al**, Si, P

Write the electron configurations for the following ions:

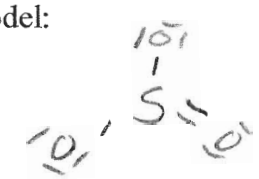
Br^-	[Ar]	$1s^2 2s^2 2p^6 3s^2 3p^6$
P^{3-}	[Ne]	$1s^2 2s^2 2p^6$
O^{2-}	[Ne]	
Xe	[Xe]	
Mg^{2+}	[Ne]	

Why is the Mg^{2+} ion smaller than F^-, even though they are isoelectronic?

More protons in Mg^{2+}

17. Write out Lewis dot structures of each of the following and then predict and draw their geometry using the VSEPR model:

SO_3

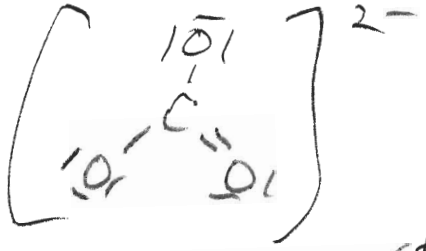


24 v.e.

has resonance structures

Trigonal PLANAR

CO_3^{2-}



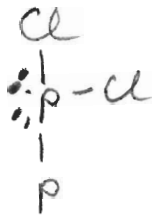
24 v.e

has resonance structures

trigonal PLANAR

PCl_3

26 v.e



T-shaped

CS_2

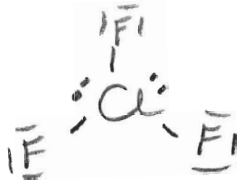
16 v.e.

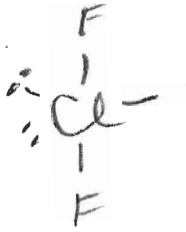
has resonance structures

LINEAR

ClF_3

28 v.e.

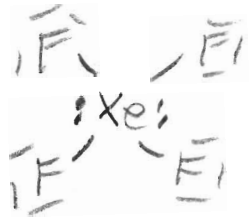


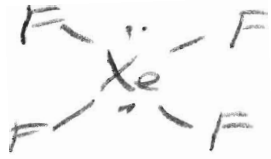


T-shaped

XeF_4

36 v.e.

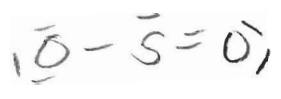




sq PLANAR

SO_2

18 v.e



Bent of Trig PL

has resonance structures

BrF_5

42 v.e