Chemistry 141 Name KEY

Cary Willard

Quiz 7a (20 points) October 27, 2009

All work must be show to receive credit. Remember, significant figures are important!

$$c=νλ, E=hν, N\_{A}=6.022×10^{23}/mol, c=3.00×10^{8}m/sec , h=6.626 ×10^{-34}J sec$$

1. (12 points) The ionization energy of lithium is 520 kJ/mol.
	1. What is the energy required to ionize 1 atom of lithium?

$$\frac{520 kJ}{mol e^{-}}×\frac{1000 J}{1 kJ}×\frac{1 mol e^{-}}{6.022×10^{23} e^{-}}=\frac{8.64×10^{-19}J}{e^{-}}\left(=\frac{8.64×10^{-22}kJ}{e^{-}}\right)$$

* 1. What is the maximum wavelength of light which will ionize lithium?

Hint – do part c first

$$c=νλ \gg \gg λ=\frac{c}{ν}=\frac{3.00×10^{8}m/sec}{1.30×10^{15}/sec}=2.30×10^{-7}m or 230 nm$$

* 1. What is the minimum frequency of light which will ionize lithium?

$$E=hν ⟹ ν=\frac{E}{h}=\frac{8.64×10^{-19}J}{6.626 ×10^{-34}J sec}=1.30×10^{15}/sec$$

* 1. What frequency of light is required to ionize an atom of lithium with an electron having a kinetic energy of 4.7 x 10-20 J?

$$total energy required= 8.64×10^{-19}J+4.7×10^{-20}J=9.11×10^{-19}J$$

$$ν=\frac{E}{h}=\frac{9.11×10^{-19}J}{6.626 ×10^{-34}J sec}=1.37×10^{15}/sec$$

1. (2 points) What is the maximum number of electrons that will fill a p orbital?

2

1. (3 points) What is the complete electronic configuration of an atom of aluminum as predicted by the periodic table?

1s2 2s2 2p6 3s2 3p1

1. (3 points) What is the shorthand electronic configuration of an atom of osmium (Os) as predicted by the periodic table?

[Xe] 6s2 5d6 4f14

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1. (12 points) The ionization energy of potassium is 419 kJ/mol.
	1. What is the energy required to ionize 1 atom of potassium?

$$\frac{419 kJ}{mol e^{-}}×\frac{1000 J}{1 kJ}×\frac{1 mol e^{-}}{6.022×10^{23} e^{-}}=\frac{6.96×10^{-19}J}{e^{-}}\left(=\frac{6.96×10^{-22}kJ}{e^{-}}\right)$$

* 1. What is the maximum wavelength of light which will ionize potassium?

Hint – do part c first

$$c=νλ \gg \gg λ=\frac{c}{ν}=\frac{3.00×10^{8}m/sec}{1.05×10^{15}/sec}=2.85×10^{-7}m or 285 nm$$

* 1. What is the minimum frequency of light which will ionize potassium?

$$E=hν ⟹ ν=\frac{E}{h}=\frac{6.96×10^{-19}J}{6.626 ×10^{-34}J sec}=1.05×10^{15}/sec$$

* 1. What frequency of light is required to ionize an atom of potassium with an electron having a kinetic energy of 5.2 x 10-20 J?

$$total energy required= 6.96×10^{-19}J+5.2×10^{-20}J=7.48×10^{-19}J$$

$$ν=\frac{E}{h}=\frac{7.48×10^{-19}J}{6.626 ×10^{-34}J sec}=1.13×10^{15}/sec$$

1. (2 points) What is the maximum number of electrons that will fill a d orbital?

2

1. (3 points) What is the complete electronic configuration of an atom of sulfur as predicted by the periodic table?

1s2 2s2 2p6 3s2 3p4

1. (3 points) What is the shorthand electronic configuration of an atom of Iridium (Ir) as predicted by the periodic table?

[Xe] 6s2 5d7 4f14