Chemistry 141 Name Key

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Quiz 5 (20 points) October 23, 2008

All work must be shown to receive credit.

Data: c=νλ, E=hν, 1/λ=-R(1/ni2-1/nf2), λ=h/mv,Δx Δh/4Π, h = 6.626 x 10-34 J sec, c = 3.00 x 108 m/sec, NA = 6.02 x 1023 /mol, kw = 1.0 x 10-14 M2

1. (6 points) For light with a wavelength of 429 nm, calculate the frequency and energy of the light.

$$ν=\frac{c}{λ}=\frac{3.00×10^{8}m/sec}{429 nm}×\frac{10^{9}nm}{1 m}=6.99×10^{14}/sec$$

$$E=hν=\left(6.626×10^{-34}J sec\right)\left(6.99×10^{14}/sec\right)=4.63×10^{-19}J $$

1. (6 points) The ionization energy of phosphorous is 1012 kJ/mol. Determine the wavelength of light that will just ionize an atom of phosphorous.

$$E\_{electron}=\frac{1012 kJ}{mol e^{-}}×\frac{1000 J}{1 kJ}×\frac{1 mol e^{-}}{6.022 ×10^{23}e^{-}}=1.68×10^{-18}J$$

$$E=\frac{hc}{λ}⟶λ=\frac{hc}{E}=\frac{\left(6.626×10^{-34}J sec\right)\left(3.00×10^{8}m/sec\right)}{\left(1.68×10^{-18}J\right)}=1.18×10^{-7}m=118 nm$$

1. (6 points) Write the complete electron configuration of copper based on the periodic chart. Do you think there might be an anomalous configuration for this atom? If so, show it and explain why you expect this configuration might exist. If not, explain why not.

Predicted by periodic table [Ar] 4s2 3d9

Predicted anomalous configuration [Ar] 4s1 3d10

1. (2 points) Arrange the following in order of increasing radius S, S-2, Ar, K+1

K+1<Ar<S<S-2