CHM 151 Quiz 9 25 Pts Fall 2006 Name: Key

SHOW WORK TO RECEIVE CREDIT

$E = h\upsilon$ $c = \lambda\upsilon$ $E_n = (-R_H)(1/n^2)$ $E = h\upsilon$

$R_H = 2.18 \times 10^{-18}$ J $c = 3.0 \times 10^8$ m/s $h = 6.63 \times 10^{-34}$ J·s

1. (3 Pts) What is the wavelength of radiation that has a frequency of $6.91 \times 10^{14}\ s^{-1}$?

$\lambda = \frac{c}{\upsilon} = \frac{3.0 \times 10^8 \text{ m/s}}{6.91 \times 10^{14}\ \text{s}^{-1}} = 4.34 \times 10^{-7}$ m

2. (3 Pts) Calculate the frequency of visible light having a wavelength of 656 nm.

$c = \lambda\upsilon$ $\upsilon = \frac{c}{\lambda} = \frac{3.0 \times 10^8 \text{ m/s}}{656 \times 10^{-9} \text{ m}} = 4.57 \times 10^{14}\ s^{-1}$

3. (3 Pts) 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.

$E_n = -R_H\left(\frac{1}{n^2}\right)$ for $n=1$: $E = -2.18 \times 10^{-18}\text{ J}\left(\frac{1}{1^2}\right) = -2.18 \times 10^{-18}$

For $n=4$: $E = -2.18 \times 10^{-18}\text{ J}\left(\frac{1}{4^2}\right) = -1.36 \times 10^{-18}$

Taking difference gives $\Delta E = 2.04 \times 10^{-18}$ J

assign a positive value because energy must be gained from $1 \rightarrow 4$.

4. (3 Pts) How many unpaired electrons does an atom of silicon have?

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5. (3 Pts) Which element has the electron configuration: $[Kr]5s^2\ 4d^{10}\ 5p^1$

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6. (3 Pts) Write out the electron configuration of a ground state Fe atom (you may use the shorthand method if you choose).

$[Ar]\ 4s^2\ 3d^6$

7. (3 Pts)Arrange the following ions in order of increasing ionic radius, Na^+, P^{3-}, S^{2-}, Cl^-. (smallest to largest)

$Na^+\ Cl^-\ S^{2-}\ P^{3-}$

8. (4 Pts) Give the ***complete*** electron configuration for each of the following and state if the atom ***or ion*** would be paramagnetic or diamagnetic.

a. Al^{3+} $1s^2\ 2p^6$ diamagnetic

b. Ga $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^1$ paramagnetic