CHM 151 Quiz 8 25 Pts Fall 2004 Name: Key

SHOW WORK TO RECEIVE CREDIT. $c = \nu\lambda$ $E = h\nu$ $c = 3.0 \times 10^8$ m/s

$E_n = (-R_H)(1/n^2)$ $h = 6.63 \times 10^{-34}$ J • s $R_H = 2.180 \times 10^{-18}$ J

1. (4 Pts) What is the wavelength of yellow light in **nanometers** having a frequency of 5.17×10^{14} s^{-1}?

$\lambda = c/\nu$

$$\frac{3.0 \times 10^8 \text{ m}}{\text{s}} \Big| \frac{\text{s}}{5.17 \times 10^{14}} \Big| \frac{\text{n}}{10^{-9}} = 580 \text{ nm}$$

2. (4 Pts) According to the quantum theory, what is the energy contained in a single quantum of orange light with a frequency of 5.00×10^{14} s^{-1}?

$E = h\nu$

$$E = \frac{6.63 \times 10^{-34} \text{ J} \cdot \text{s}}{\text{s}} \Big| 5.00 \times 10^{14} = 3.315 \times 10^{-19} \text{ J}$$

3. (4 Pts) What is the wavelength of light emitted when the hydrogen atom undergoes a transition from level n = 5 to level n = 2?

$n = 5$ $E_n = \frac{-R_H}{n^2} = \frac{-2.180 \times 10^{-18} \text{J}}{5^2} = -8.72 \times 10^{-20} \text{J}$

$\Delta E = 4.57 \times 10^{-19}$ J

$n = 2$ $E_n = \frac{-R_H}{n^2} = \frac{-2.180 \times 10^{-18} \text{J}}{2^2} = -5.45 \times 10^{-19} \text{J}$

then $E = h\nu = \frac{hc}{\lambda}$

$\lambda = \frac{hc}{E} =$

$$\lambda = \frac{6.63 \times 10^{-34} \text{ J} \cdot \text{s}}{4.57 \times 10^{-19} \text{ J}} \Big| \frac{3.0 \times 10^8 \text{ m}}{\text{s}}$$

$\lambda = 4.34 \times 10^{-7}$ m

4. (6 Pts) Write out the electronic configuration of

a. the Al^{3+} ion

Same as [Ne]: $1s^2 2s^2 2p^6$

b. the gallum ion, Ga^{3+}

[As] $3d^{10}$ or $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10}$

c. a calcium atom

$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$

5. (3 Pts) Which of the following atoms has the smallest atomic radius?

a. Na b. Al (c. S) d. As e. Br

further to the right and upward

6. (3 Pts) Which of the following elements has the smallest ionization energy?

a. F b. Be c. B d. Mg (e. Al)

7. (1 Pt) Ask and answer any CHEMISTRY question that you felt should have been on this quiz.