Chemistry-4311
September 11, 2009

Quiz #1 **Name** Key

1. Matching (Use a letter only once)

The Heisenberg uncertainty principle says it is impossible to specify simultaneously the precise position and __j__ of a particle.

When a model is tested by experiments, and shown to represent experiments, it becomes a __d__.

The energy of a photon is __e__.

The unit for energy is __c__.

The probability of finding an electron in an atom at a specific position is __g__.

a. Ψ
b. energy
c. mass x distance^2/time^2
d. theory
e. hv
f. mass x distance/time^2
g. Ψ^2
h. $h\lambda$
i. law
j. momentum

2. If the quantum number n = 3 and l = 2, the values for m_l are:

$m_l = 2, 1, 0, -1, -2$ These m_l are for the 3d orbitals

3. This question deals with the *photoelectric effect*. Light with a wavelength of 300×10^{-9} m is incident on a potassium surface for which the work function is 3.62×10^{-19} J. Calculate the energy and velocity of the ejected electrons. $\nu = c/\lambda$, $c = 3 \times 10^8$ m/s, $h = 6.63 \times 10^{-34}$ J/s, and $m_e = 9.1 \times 10^{-31}$ kg. Include units in your answers.

Energy of photon is $E = h\nu = \frac{6.63 \times 10^{-34}\ J.s \times 3 \times 10^{8}\ m/s}{300 \times 10^{-9}\ m}$

$= 0.0663 \times 10^{-17}$ J

$= 6.63 \times 10^{-19}$ J +1

Energy of ejected electron

$E_e = h\nu - \Phi = 6.63 \times 10^{-19}\ J - 3.62 \times 10^{-19}\ J = \underline{\underline{3.01 \times 10^{-19}\ J}}$ +1

$E_e = \frac{m_e v^2}{2}$ $\quad v = \sqrt{\frac{2E_e}{m_e}} = \sqrt{\frac{2 \times 3.01 \times 10^{-19}}{9.1 \times 10^{-31}}}$

$= \underline{8.13 \times 10^5\ m/s}$ +1