Physics - 2 Worksheet

1. A high-frequency photon is scattered off of an electron and experiences a change of wavelength of 1.7×10^{-4} nm At what angle must a detector be placed to detect the scattered photon (relative to the direction of the incoming photon)?

2. How much total kinetic energy will an electron–positron pair have if produced by a $3.64 - MeV$ photon?

3. Calculate the wavelength of a 0.21 kg ball traveling at 0.10 m/s

4. What is the wavelength of a neutron ($m = 1.67 \times 10^{-27}$ kg) traveling at 8.5×10^4 m/s

5. An electron has a de Broglie wavelength $\lambda = 4.5 \times 10^{-10} m$(a) What is its momentum? (b) What is its speed? (c) What voltage was needed to accelerate it from rest to this speed?

6. For the three hydrogen transitions indicated below, with n being the initial state and $n^{'}$ being the final state, is the transition an absorption or an emission?Which is higher, the initial state energy or the final state energy of the atom? Finally, which of these transitions involves the largest energy photon? (a) $n = 1,$ $n^{'} = 3$ (b) $n = 6,$ $n^{'} = 2$ (c) $n = 4,$ $n^{'} = 5$

7. How much energy is needed to ionize a hydrogen atom in the $n = 3$ state?

8. The second longest wavelength in the Paschen series in hydrogen corresponds to what transition?

9. What is the longest wavelength light capable of ionizing a hydrogen atom in the ground state?

10. What wavelength photon would be required to ionize a hydrogen atom in the ground state and give the ejected electron a kinetic energy of $11.5eV$?

11. What is the uncertainty in position, imposed by the uncertainty principle, on a $150 - g$ baseball thrown at $(42 \pm 1) m/s$?

12. If an electron's position can be measured to a precision 2.4×10^{-8} m of how precisely can its speed be known?