**Problems from 27.1 - Photon Theory**



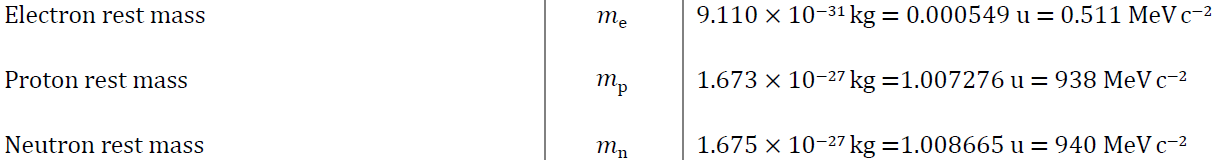
1. What is the frequency of a 3.00 m long radio wave? (1.00x108 Hz)
2. What is the frequency of a 400. nm light wave? (7.50x1014 Hz)
3. What is the frequency of a 12.0 cm microwave? (2.50x109 Hz)
4. What is the wavelength of a 91.1 MHz FM radio wave? (3.29 m)
5. What is the wavelength of a 60.0 Hz radio wave? (5.00x106 m)

1. What is the wavelength of a 2.13 eV photon? (583 nm)
2. What is the energy in eV of a 400. nm light wave? (3.10 eV)
3. What is the energy in eV of a 700. nm light wave? (1.77 eV)
4. What is the wavelength of a 1.20 MeV photon? (1.03x10-12 m)
5. What is the energy of a 0.00130 nm photon in eV? (9.54x105 eV)



1. 415 nm light ejects photo-electrons from a metal with a work function of 2.06 eV. What is the stopping potential of the photo-electrons? (0.930 V)
2. 213 nm light ejects photo-electrons from a metal with a work function of 3.10 eV. What is the kinetic energy of the photo-electrons in eV? (2.73 eV)
3. 117. nm light ejects photo-electrons that have a stopping potential of 3.56 V from a metal. What is the work function of the metal in electron volts? (7.05 eV)
4. Light ejects photo-electrons that have a stopping potential of 1.17 V from a metal with a work function of 2.36 eV. What is the wavelength of the light? (352 nm)
5. 315 nm light ejects photo-electrons from a metal that have a stopping potential of 2.65 V. What is the work function of the metal in electron volts? (1.29 eV)



1. A photon creates a proton/anti proton pair each with 180. MeV of kinetic energy. What is the maximum wavelength the photon could have? (5.55x10-16 m)
2. A photon with a wavelength of 7.21x10-13 m creates an electron/positron pair each with what maximum kinetic energy? (0.349 MeV)
3. A photon creates an electron/positron pair each with 3.20 MeV of energy. What is its wavelength? (1.67x10-13 m)
4. A 5.85x10-16 m photon creates a neutron/anti neutron pair each with what kinetic energy? (121 MeV)
5. A 3.20x10-15 m photon creates a charged matter/anti matter pair each having a kinetic energy of 53.9 MeV. What is the rest mass of the particles created in MeV? (140. MeV)

  ←This is not in the data packet

1. What is the velocity of a **proton** with a de Broglie wavelength of 450. nm? (0.880 m/s)
2. What is the mass of a particle that has a de Broglie wavelength of 926 nm, and a velocity of 0.265 m/s? (2.70x10-27 kg)
3. What is the de Broglie wavelength of an **electron** with a velocity of 1750 m/s? (416 nm)
4. What is the velocity of **proton** with a de Broglie wavelength of 1.00 x 10-10 m? (3.96x103 m/s)
5. A particle going 1200. m/s has a de Broglie wavelength of 137 nm. What is the mass of the particle? (4.03x10-30 kg)