Modern physics Chapter 7-8

7.1.1 Calculate the wavelength for the Balmer series λ_{10} (i.e. for $m = 10$).

Answer: 380 nm

7.3.1 What is the energy difference between level n = 2 and n = 1 for the hydrogen atom expressed in the unit eV.

Answer: 10.2 eV

7.3.2 Calculate the wavelength for the convergence limit of the Balmer series.

Answer: 365 nm

7.3.3 Calculate the wavelength en for the convergence limit of the Lyman series.

Answer: 91.2 nm

7.4.1 One puts 40 kV over an X-ray tube. Calculate the shortest wavelength we can get from the tube.

Answer: 31 pm

7.4.2 Calculate the lowest energy E_1 for an element with $Z = 10$ i the unit eV.

Answer: 1.1 keV

7.4.3 What is the energy difference between E_2 and E_1 for the element with $Z = 10$?

Answer: 826 eV

7.4.4 What will the frequency become in the corresponding transition?

Answer: 1,99 x 10^{17} Hz

8.4.1 For a diatomic molecule one measured the vibrational energy E_0 till 212 cm^{-1} (common unit in chemical physics) for $\upsilon = 0$. Calculate the vibrational constant ω_e for the molecule.

Answer: 414 cm^{-1}.

8.4.2 The rotational energy $F(J)$ can be determined if you know the B-value (rotational constant) of a molecule. Suppose that B = 4,4 cm^{-1}. Calculate $F(J=5)$.

Answer: $F(J=5)$ = 132 cm^{-1}.