Exercises 2

Exercise 2.1

Radiation illuminating a sodium surface causes an electron to be emitted at a speed of 100 m/s. What is the wavelength of the incident beam?

(ionization energy $E_I = 2.28$ eV et 1 eV = $1.602 \cdot 10^{-19}$ J)

Exercise 2.2

A lamp emits energy equivalent to 7 J every second. In 10 s, $9.4 \cdot 10^{19}$ photons are emitted. Assuming that all these photons have the same frequency, what is this frequency in PHz?

Exercise 2.3

What is the speed (in m/s) of a neutron with a wavelength of $4.43 \cdot 10^{-1}$ nm? Knowing that the size of objects detected by a measurement depends on the wavelength used, give a possible application for such short wavelengths.

Exercise 2.4

A photon with a wavelength of 150 pm ejects an electron from an atom with an ionization energy of $1.12 \cdot 10^{-15}$ J. How fast will this electron be emitted?

Exercise 2.5

The energy required to ionize a given atom is $3.44 \cdot 10^{-18}$ J. This atom absorbs a photon by emitting an electron at $1.03 \cdot 10^{6}$ m/s.

What is the wavelength and type (UV, visible, infrared, gamma, ...) of the photon that was absorbed?

Exercise 2.6

What is the change in energy of a lithium atom emitting a photon with a wavelength of 683 nm? What is the color of the emitted photon?

Exercise 2.7

An electron is enclosed in a space whose size is of the order of magnitude of an atom:100 pm. What is the minimum uncertainty of its momentum?