4.3.4. Classical atom

Consider a classical electron in a circular orbit in a Coulomb potential, for which the virial theorem yields $\bar{V} = 2E$.

a) Assuming that the electron continues to move on a circle as it radiates, calculate the average power radiated as a function of E.

    hint: Note that the power is not a linear function of E, in contrast to the preceding two problems!

b) Show that the electron reaches the nucleus in a finite amount of time. For a hydrogen atom, calculate that time if the initial orbit had a radius $r_0 = 10^{-8}\,\mathrm{cm}$.

(5 points)

4.3.5. Absence of dipole radiation

Show that a system of particles that all have to the same ratio of charge to mass and are not subject to any external forces cannot emit either electric or magnetic dipole radiation.

(3 points)

4.3.6. Rotating dipole

An electric dipole moment $\boldsymbol{d}$ rotates uniformly with angular velocity Ω in a plane. Find the radiated power per solid angle, and the total radiated power, averaged over one rotational period.

(5 points)