For these questions, use the simulation “The photoelectric effect” and work through the simulation, including the step-by-step exploration (click on the “Step-by-step Exploration” tab).

Planck’s constant: $h = 6.626 \times 10^{-34} Js$

Electron charge: $e = 1.6 \times 10^{-19} J$

1) Define what is meant by the *work function* of a metal. Explain the relation between the work function of a metal and the kinetic energy of the emitted photoelectrons. What is the validity range of this relation?

2) Define the stopping potential V_{stop} in the experimental setup shown in the simulation. Explain how the stopping potential relates to the maximal kinetic energy of the emitted photoelectrons.

3) From the simulation, determine the work function of Cesium in units of Joule and in units of eV.

4) Consider light of intensity $10^{-5}\, Wm^{-2}$ falling on the Cesium target. Classically, how long would it take to absorb enough energy to release an electron, given that the cross-sectional area of a Cesium atom is roughly $10^{-19}\, m^2$? Comment on your result.

5) Barium has a work function of $2.5\, eV$. Determine the stopping voltage and the maximal kinetic energy of the photoelectrons in units of eV when

a) ultraviolet light of frequency $8.5 \times 10^{14} Hz$ falls on the Barium target.

b) red light of frequency $4.5 \times 10^{14} Hz$ falls on the Barium target.

Compare your results with those given in the simulation.