Problems discussed in the videos:

Videos (6) – (7)
Sunlight, whose visible wavelengths range from 380 to 750 nm, is incident on a metal surface with an intensity of $0.8 kW/m^2$.
(a) If the light was all of wavelength 750nm, how many photons per second would be falling on 2.0 cm^2 of the surface?
(b) In the range of visible wavelengths, which wavelength corresponds to incident photons that carry the greatest energy? Explain.
(c) Since the light consists of light from several wavelengths, are there more or fewer photons arriving than you calculated in part (a)?

Videos (8) – (9)
A person's vision may be improved significantly by having the cornea reshaped with a laser beam, in a procedure known as photorefractive keratectomy. The excimer laser used in these treatments produces ultraviolet light with a wavelength of 193 nm.
(a) What is the difference in energy between the two levels that participate in stimulated emission in the excimer laser? Explain.
(b) How many photons from this laser are required to deliver a total energy of 1.58×10^{-13} J to the cornea? Explain.

Video (10)
What is the de Broglie wavelength of a beam of electrons with kinetic energy of 2×10^{-25} joules? (At this kinetic energy the electrons are not relativistic.)

Videos (11) – (12)
Consider a lithium (Z=3) ion that has been ionized so that it has only one electron (Li^{++}).
(a) An electron is initially in the n=7 state. It gives off a photon, moving into the n=5 state. What is the wavelength of the photon?
(b) Can an electron initially in the ground state of Li^{++} absorb two successive photons (e.g., absorb one and then later absorb another) each with an energy of 54.4 eV? If so, what is its final state; if not, why not?
(c) What is the frequency of light necessary to pull the electron out from a ground state Li^{++} ion?
(d) Suppose the light from part (c) is passed through a diffraction grating with a spacing of 5000 slits per cm and shines on a screen a distance 1 meter from the grating. What is the distance between the central maximum (m=0) and the side maximum (m=1) of intensity?
(e) An electron is initially in the n=3 state. It emits one or more photons and ends up in the ground state. List all the wavelengths of photons that might be produced.