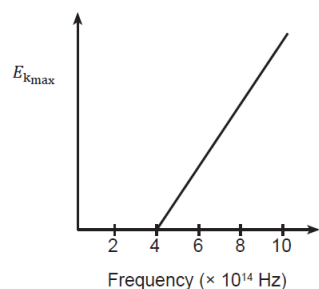


Blackbody Radiation

1. Calculate the energy of a single photon if it has a frequency of 1.5×10^{15} Hz.
2. What is the wavelength of a photon having an energy of 2.12 eV?

Photoelectric Effect

3. Calculate the threshold frequency that causes photoelectric emission from a metal surface having a work function of 2.00 eV.
4. If the stopping potential of a photoelectric cell is 5.60 V, what is the maximum kinetic energy of the photoelectrons emitted?
5. A metal with a work function of 4.56 eV is illuminated by light with a wavelength of 1.7×10^{-7} m. What is the maximum kinetic energy of the emitted electrons?
6. In a photoelectric effect experiment, light is shone on a metal surface. The graph below illustrates the maximum kinetic energy of ejected electrons versus frequency of the incident light of the photons. Determine the work function of the metal.



Compton Effect

7. What is the momentum of a photon with wavelength 4.51×10^{-11} m?
8. Calculate the speed of an electron having the same momentum as a photon with a wavelength of 8.0×10^{-10} m.

Bohr's Model of the Atom

9. If an electron orbiting the nucleus of a hydrogen atom falls from a higher energy level back to the second energy level, and a photon with frequency of 6.15×10^{14} Hz is emitted, determine the original energy level of the electron.
10. What is the change in energy when an electron drops from $n = 5$ to $n = 3$?
11. An electron in a hydrogen atom has -0.544 eV of energy. What energy level is this electron in?

12. Calculate the wavelength of the photon emitted when an electron in a hydrogen atom moves from the fifth to the second energy level.

The DeBroglie Hypothesis

13. What is the de Broglie wavelength of an electron that has a velocity of 4.8×10^6 m/s?
14. Calculate the de Broglie wavelength of a 1.0×10^3 kg car moving at 25 m/s.

Answers

1	$E = 9.9 \times 10^{-19}$ J
2	$\lambda = 5.86 \times 10^{-7}$ m
3	$f = 4.83 \times 10^{14}$ Hz
4	$E_k = 8.97 \times 10^{-19}$ J
5	$E_k = 4.39 \times 10^{-19}$ J
6	$W_0 = 1.66$ eV
7	$p = 1.47 \times 10^{-23}$ kg m/s
8	$v = 9.10 \times 10^5$ m/s
9	$n = 4$
10	$E = 0.967$ eV
11	$n = 5$
12	$\lambda = 4.35 \times 10^{-7}$ m
13	$\lambda = 1.52 \times 10^{-10}$ m
14	$\lambda = 2.65 \times 10^{-38}$ m