Remember:

Show all your work for full credit. Minimum of 3 steps:
• What equation are you plugging into?
• What numbers are you substituting?
• What is your final answer? Ask if anything seems unclear.

Formulae and Constants:

\[ e = 1.60 \times 10^{-19} \text{ Coulombs} \]
\[ 1 \text{ eV} = 1.60 \times 10^{-19} \text{ J} \]
\[ E = hf = \frac{hc}{\lambda} \]
\[ h = \text{Planck's const} = 6.63 \times 10^{-34} \text{ J} \cdot \text{s} \]
\[ \text{momentum, } p = \frac{h}{\lambda} = 4.14 \times 10^{-15} \text{ eV} \cdot \text{s} \]
\[ hc = 1240 \text{ eV} \cdot \text{nm} \]
\[ c = \text{“speed of light”} = \frac{1}{\sqrt{(\varepsilon_0 \mu_0)}} = 3 \times 10^8 \text{ m/s} \]

Blackbody Radiation:

Wien displacement law \[ \lambda_{\text{max}} T = 0.9 \times 10^6 \text{ nm} \cdot \text{K} \]
Stefan-Boltzmann law \[ \sigma = 5.67 \times 10^{-8} \text{ W} / (\text{m}^2 \cdot \text{K}^4) \]

\[ \text{energy / (time \cdot area)} = \sigma T^4 \]

Photoelectric Effect

\[ hf = \phi + E_k \quad \text{or} \quad \frac{hc}{\lambda} = \phi + eV_0 \quad \text{or} \quad \frac{hc}{\lambda} = \frac{hc}{\lambda_c} + eV_0 \]

Bohr Model of Atom

Allowed energy levels: \[ E_n = -13.6 \text{ eV} / n^2 \]
Energies of photons that can be emitted or absorbed = [exactly] \[ |E_{n_1} - E_{n_2}| \]

Reflection/refraction

\[ n = \frac{c}{v} \quad \lambda_n = \lambda / n \]

Snell’s Law: \[ n_1 \sin \theta_1 = n_2 \sin \theta_2 \]

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