P28.5 Each photon has an energy $E = hf = \left(6.626\times10^{-34}\right)\left(99.7\times10^{6}\right) = 6.61\times10^{-26}\ \text{J}$.

This implies that there are $\dfrac{150\times10^{3}\ \text{J/s}}{6.61\times10^{-26}\ \text{J/photon}} = \boxed{2.27\times10^{30}\ \text{photons/s}}$.

P28.9 (a) $$\lambda_c = \frac{hc}{\phi} = \frac{\left(6.626\times10^{-34}\ \text{J}\cdot\text{s}\right)\left(3.00\times10^{8}\ \text{m/s}\right)}{\left(4.20\ \text{eV}\right)\left(1.60\times10^{-19}\ \text{J/eV}\right)} = \boxed{296\ \text{nm}}$$

$$f_c = \frac{c}{\lambda_c} = \frac{3.00\times10^{8}\ \text{m/s}}{296\times10^{-9}\ \text{m}} = \boxed{1.01\times10^{15}\ \text{Hz}}$$

(b) $\dfrac{hc}{\lambda} = \phi + e\Delta V_S$: $$\frac{\left(6.626\times10^{-34}\right)\left(3.00\times10^{8}\right)}{180\times10^{-9}} = \left(4.20\ \text{eV}\right)\left(1.60\times10^{-19}\ \text{J/eV}\right) + \left(1.60\times10^{-19}\right)\Delta V_S$$

Therefore, $\boxed{\Delta V_S = 2.71\ \text{V}}$

P28.20 $$\lambda = \frac{h}{p} = \frac{h}{mv} = \frac{6.626\times10^{-34}\ \text{J}\cdot\text{s}}{\left(1.67\times10^{-27}\ \text{kg}\right)\left(1.00\times10^{6}\ \text{m/s}\right)} = \boxed{3.97\times10^{-13}\ \text{m}}$$

P28.31 For the electron, $\Delta p = m_e \Delta v = \left(9.11\times10^{-31}\ \text{kg}\right)\left(500\ \text{m/s}\right)\left(1.00\times10^{-4}\right) = 4.56\times10^{-32}\ \text{kg}\cdot\text{m/s}$

$$\Delta x = \frac{h}{4\pi\Delta p} = \frac{6.626\times10^{-34}\ \text{J}\cdot\text{s}}{4\pi\left(4.56\times10^{-32}\ \text{kg}\cdot\text{m/s}\right)} = \boxed{1.16\ \text{mm}}.$$

For the bullet, $\Delta p = m\,\Delta v = \left(0.020\,0\ \text{kg}\right)\left(500\ \text{m/s}\right)\left(1.00\times10^{-4}\right) = 1.00\times10^{-3}\ \text{kg}\cdot\text{m/s}$

$$\Delta x = \frac{h}{4\pi\Delta p} = \boxed{5.28\times10^{-32}\ \text{m}}.$$