

HW 9/22

3.19)

$$Mg: \phi = 3.7 \text{ eV} = 3.7 \cdot 1.6 \cdot 10^{-19} \text{ J}$$

$$m = 9.11 \cdot 10^{-31} \text{ kg}$$

$$v = 2 \cdot 10^6 \text{ m/s}$$

$$KE = hf - \phi = \frac{1}{2}mv^2$$

$$f = \frac{\frac{1}{2}mv^2 + \phi}{h} = \frac{c}{\lambda} \Rightarrow$$

$$\lambda = \frac{ch}{\frac{1}{2}mv^2 + \phi}$$

$$\lambda = 82.3 \text{ nm}$$

3.21)

$$\frac{\text{energy/time}}{\text{energy/photon}}$$

$$= \frac{40 \cdot 10^3 \text{ J/s}}{h \cdot 940 \cdot 10^3 \text{ Hz}}$$

$$= 6.42 \cdot 10^{31} \text{ photons/sec}$$

3.24)

$$\lambda = 520 \text{ nm}$$

$$KE = hf - \phi$$

a)

$$v_i = 1.78 \cdot 10^5 \text{ m/s}$$

$$\phi = \frac{hc}{\lambda} - \frac{1}{2}mv_i^2$$

$$m = 9.11 \cdot 10^{-31} \text{ kg}$$

$$\Rightarrow \phi = 3.68 \cdot 10^{-19} \text{ J} = 2.3 \text{ eV}$$

From 3.19: $\lambda = \frac{hc}{\frac{1}{2}mv_o^2 + \phi}$

$$v_o = 4.81 \cdot 10^5 \text{ m/s}$$

$$\lambda = 420 \text{ nm}$$

↳ sodium

ep13) a)

$$DE = 0$$

$$KE + U = 0$$

$$\frac{1}{2}mv^2 = q|AV|$$

$$v = \sqrt{\frac{2q|AV|}{m}}$$

b) $q_e = 1.602 \cdot 10^{-19} \text{ C}$

$$m = 9.11 \cdot 10^{-31} \text{ kg}$$

$$\Delta V = 100 \cdot 10^3 \text{ V}$$

$$C \cdot V = J$$

$$J = \text{kg} \frac{\text{m}^2}{\text{s}^2}$$

$$v = \sqrt{\frac{2 \cdot 1.6 \cdot 10^{-19} \cdot 100 \cdot 10^3 \text{ C} \cdot \text{V}}{9.11 \cdot 10^{-31} \text{ kg}}}$$

$$v = \sqrt{3.5126 \text{ kg} \frac{\text{m}^2}{\text{s}^2} / \text{kg}}$$

$$v = 1.874 \cdot 10^7 \text{ m/s}$$