

Bokenuppgifter

1.1

a) $m = 0,050 \text{ kg}$, $v = 20 \text{ m/s}$

$$\lambda = \frac{h}{p} = \frac{h}{mv} = \boxed{6,6 \cdot 10^{-34} \text{ m}}$$

b) $E_k = 10 \text{ eV} = 1,6 \cdot 10^{-18} \text{ J}$

$$mc^2 = (9,11 \cdot 10^{-31}) \cdot (3 \cdot 10^8)^2 = \underline{8,19 \cdot 10^{-14} \text{ J}}$$

$$E = E_k + mc^2 = 8,19 \cdot 10^{-4} \text{ eV}$$

$$p = \frac{\sqrt{E^2 - mc^4}}{c} = 1,71 \cdot 10^{-24}$$

$$\lambda = \frac{h}{p} = 3,9 \cdot 10^{-10} = \boxed{3,9 \text{ \AA}}$$

1.2

100 photons/second

$$\lambda = 550 \cdot 10^{-9} \text{ m} \Rightarrow E = \frac{hc}{\lambda} = 3,6 \cdot 10^{-19} \text{ J}$$

$$3,6 \cdot 10^{-19} \cdot 100 = \boxed{3,6 \cdot 10^{-17} \text{ W}}$$

1.3

$$\lambda_1 = 380 \text{ nm}, \quad \lambda_2 = 770 \text{ nm}$$

$$E = \frac{hc}{\lambda} \Rightarrow E_1 = \frac{hc}{380 \cdot 10^{-9}}, \quad E_2 = \frac{hc}{770 \cdot 10^{-9}}$$

1.7

$$\lambda (\text{\AA}) = \frac{12400}{E (\text{eV})}$$

$$E = \frac{hc}{\lambda} \Leftrightarrow E \cdot 1,6 \cdot 10^{-19} = \frac{hc}{\lambda \cdot 10^{-10}} \Leftrightarrow$$

$$\lambda (\text{\AA}) = \frac{hc}{1,6 \cdot 10^{-29}} \cdot \frac{1}{E (\text{eV})} = \frac{12400}{E (\text{eV})}$$

#ezpe ()

1.12

$$c = f \cdot \lambda$$

1.10

$$P = 1000 \text{ W/m}^2 \quad \lambda = 550 \text{ nm}$$

$$\Leftrightarrow \frac{1}{10} \text{ W/cm}^2 \quad E = \frac{hc}{\lambda}$$

$$E \cdot n = \frac{1}{10} \Rightarrow n = \frac{1}{10E} = \frac{\lambda}{10hc} = 2,77 \cdot 10^{17}$$

1.15

$$d = 90 \text{ km} = 9 \cdot 10^4 \text{ m}, \quad v = 3 \cdot 10^8$$

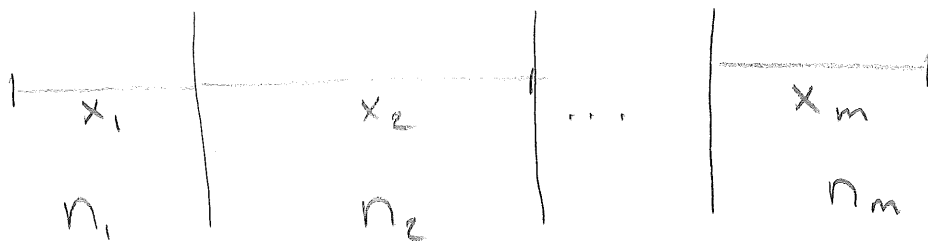
$$a) \quad t = \frac{d}{v} = \frac{9 \cdot 10^4}{3 \cdot 10^8} = \boxed{3 \cdot 10^{-4} \text{ s}}$$

$$b) \quad v = 340 \text{ m/s}$$

$$s = 340 \cdot 3 \cdot 10^{-4} = 3 \cdot 10^2 \cdot 3 \cdot 10^{-4} \approx \boxed{0,1 \text{ m}}$$

CHAPTER 2

2.1



$$i \ n_i: \quad x_i = v_i \cdot t_i, \quad n_i = \frac{c}{v_i} \Leftrightarrow v_i = \frac{c}{n_i}$$

$$t_m = \frac{x_m n_m}{c}$$

$$T = \sum_{i=1}^m \frac{x_i n_i}{c}$$