

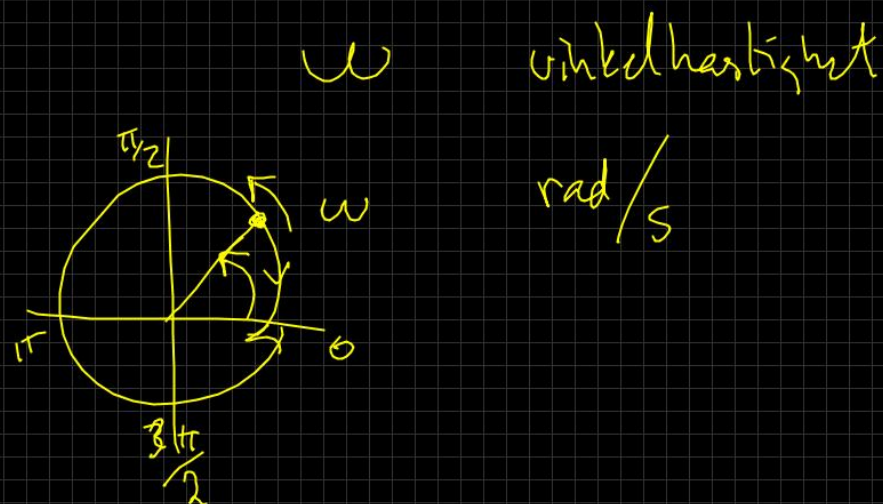
L12

• Demo av fotoelektrisk effekt L12 →

• Studiehandledning Vågor

• Uppgifter på tavlan

9	12.1-12.5	s 229-235	12: 1 2 3 4 5 6 7	
10	12.6-12.8	s 235-239	12: 8 9 10 11 12 13 14 15 16 17 18 19 20 21	12: 9
11	Lab. Plancks konstant			
	Prov vågor			



12.12

$$P = \underline{1,0 \text{ mW}} = 1,0 \cdot 10^{-3} \text{ W}$$

$$\lambda = 3,0 \text{ cm} = \boxed{3,0 \cdot 10^{-2} \text{ m}}$$

$$P_g = 3 \cdot 10^9 \cdot 1,0 \cdot 10^{-3} = 3 \cdot 10^6 = 3 \text{ MW}$$

$$\left[\begin{array}{l} c = 2,9979 \cdot 10^8 \text{ m/s} \\ h = 6,6261 \cdot 10^{-34} \text{ Js} \end{array} \right]$$

a)

$$\boxed{P} = \frac{E_{\text{tot}}}{t}$$

$$E_{\text{tot}} = n E_f$$

$$E_f = h \cdot f$$

$$\boxed{c = f \cdot \lambda}$$

$$\boxed{P} = \frac{n E_f}{t} = \frac{n h \cdot f}{t} = \frac{n \cdot h \cdot \frac{c}{\lambda}}{t} = \boxed{\frac{n \cdot h \cdot c}{\lambda t}}$$

$$\frac{n}{t} = \frac{P \cdot \lambda}{h \cdot c} = \frac{1,0 \cdot 10^{-3} \cdot 3,0 \cdot 10^{-2}}{6,6261 \cdot 10^{-34} \cdot 2,9979 \cdot 10^8} = 1,5 \cdot 10^{20} \text{ st/s}$$

$$\text{b) } \lambda_g = 0,010 \text{ nm} = \boxed{0,010 \cdot 10^{-9} \text{ m}}$$

$$\frac{n}{t} = 1,5 \cdot 10^{20} \text{ st/s}$$

$$P = \frac{n}{t} \cdot \frac{h c}{\lambda_g} = \frac{1,5 \cdot 10^{20} \cdot 6,6261 \cdot 10^{-34} \cdot 2,9979 \cdot 10^8}{0,010 \cdot 10^{-9}}$$

$$P = 2,98 \cdot 10^6 \approx \underline{\underline{3,0 \text{ MW}}}$$

$$\left[\begin{array}{l} \frac{\lambda}{\lambda_g} = \frac{3,0 \cdot 10^{-2}}{0,010 \cdot 10^{-9}} \\ = 300 \cdot 10^7 \\ = \boxed{3 \cdot 10^9} \end{array} \right]$$

12.13 $P = 2,0 \text{ mW}$ (jämnt fördelat)

$f_1 = 0,40 \text{ PHz}$, $P_1 = 1,0 \text{ mW}$

$f_2 = 0,50 \text{ PHz}$, $P_2 = 1,0 \text{ mW}$

$$\frac{n_1}{t} + \frac{n_2}{t} = \frac{P_1}{hf_1} + \frac{P_2}{hf_2} = \frac{1,0 \cdot 10^{-3}}{6,6261 \cdot 10^{-34} \cdot 0,40 \cdot 10^{15}} + \frac{1,0 \cdot 10^{-3}}{6,6261 \cdot 10^{-34} \cdot 0,50 \cdot 10^{15}} = \underline{\underline{6,8 \cdot 10^{15} \text{ s}^{-1}}}$$

$\downarrow$
 $3,8 \cdot 10^{15}$

$\downarrow$
 $3,0 \cdot 10^{15}$

$$P_1 = \frac{E_{\text{tot},1}}{t} = \frac{n_1 \cdot E_1}{t} = \frac{n_1 \cdot h \cdot f_1}{t}$$

$$P_2 = \frac{n_2 \cdot h \cdot f_2}{t} \quad (+)$$

