HW1 答案

3.

(1) $\frac{n_2 \cdot g_1}{n_1 \cdot g_2} = e^{-\frac{h\nu}{kT}} \Rightarrow \frac{n_2}{n_1} = 4 \times \exp\left[-\frac{1.64\times10^{-18}}{1.38\times10^{-23}\times2700}\right] = 3.11\times10^{-19}$

$\because n_1 + n_2 = 10^{20}$

$\therefore n_2 \approx 31$

(2) $P = 10^8 \times 31 \times 1.64\times10^{-18} = 5.084\times10^{-9}\ W$

11.

$V_{+0.1C} = V_0\sqrt{\frac{1+V/C}{1-V/C}} = \sqrt{\frac{1.1}{0.9}}\cdot\frac{C}{\lambda} = \sqrt{\frac{1.1}{0.9}}\cdot\frac{3\times10^8}{0.6328\times10^{-6}} = 5.241\times10^{14}\ Hz$

同理可知：$V_{-0.1C} = 4.288\times10^{14}\ Hz$；

$V_{+0.5C} = 8.211\times10^{14}\ Hz$；$V_{-0.5C} = 2.737\times10^{14}\ Hz$

13.

(1) $I(z) = I(0)e^{-Az}$

$\frac{I(z)}{I(0)} = e^{-0.01\times100} = \frac{1}{e} = 0.368$

(2) $I(z) = I(0)e^{Gz}$

$\frac{I(z)}{I(0)} = e^{G\cdot1} = 2$

$\Rightarrow G = \ln 2 = 0.693\ m^{-1}$