

Calculate the maximum wavelength of microwave radiation that will be absorbed at 0K in  
a) Pb,  $T_c = 7.19\text{K}$  b) Al,  $T_c = 1.2\text{K}$

**Solution**

The Cooper pair binding energy, or gap energy, is

$$E_g \approx 3kT_c \leq h\nu = \frac{hc}{\lambda}$$

From hence

$$\lambda_{\max} = \frac{hc}{3kT_c}$$

$$\text{a) } \lambda_{\max} = \frac{6.6 \cdot 10^{-34} \text{ J} \cdot \text{s} \cdot 3 \cdot 10^8 \text{ m/s}}{3 \cdot 1.38 \cdot 10^{-23} \text{ J/K} \cdot 7.19\text{K}} = 6.65 \cdot 10^{-4} \text{ m}$$

$$\text{b) } \lambda_{\max} = \frac{6.6 \cdot 10^{-34} \text{ J} \cdot \text{s} \cdot 3 \cdot 10^8 \text{ m/s}}{3 \cdot 1.38 \cdot 10^{-23} \text{ J/K} \cdot 1.2\text{K}} = 3.98 \cdot 10^{-3} \text{ m}$$

**Answer**

$$\text{a) } \lambda_{\max} = 6.65 \cdot 10^{-4} \text{ m}$$

$$\text{b) } \lambda_{\max} = 3.98 \cdot 10^{-3} \text{ m}$$