

To hear and view this Pencast PDF on your computer,  
[click here](#) to get the latest version of Adobe® Reader®.

Microwave radiation  $\lambda = 10.8 \text{ cm}$   
how many photons to heat 205 ml of coffee  
 $25 \rightarrow 62^\circ\text{C}$

$$\text{Density} = 0.997 \text{ g/ml}$$

$$\text{heat capacity } 4.184 \text{ J g}^{-1} \text{ K}^{-1}$$

— how many photons

$$E (\text{one photon}) = h\nu = hc/\lambda \quad \underline{\underline{6 = \text{mass}/\text{vol}}}$$

$$\underline{E = 6.626 \times 10^{-34} \times 3 \times 10^8 / 0.108}$$
$$= 1.84 \times 10^{-24} \text{ J / photon}$$

$$205 \text{ ml} = ? \text{ g} \quad \text{mass} = 205 \times 0.997$$
$$= 204 \text{ g}$$

$$T \text{ diff? } 62 - 25 = 37^\circ\text{C} = 37 \text{ K}$$

$$\text{Energy (J)} = 4.184 \times 204 \times 37$$
$$= \cancel{J} \cancel{g} \cancel{K} \cancel{J} \cancel{g} \cancel{K}$$

$$\text{Total no. of photons} = \frac{31580}{1.84 \times 10^{-24}}$$

$$= 1.72 \times 10^{28} \text{ photons}$$