

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

Density = 0.997 g/ml  
heat capacity 4.184 J g<sup>-1</sup> K<sup>-1</sup>  
- how many photons

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

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

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

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

$$\text{Energy (J)} = 4.184 \times 204 \times 37$$
$$= \frac{\text{J g}^{-1} \text{K}^{-1} \times \text{g} \times \text{K}}{31580 \text{ J}}$$

$$\text{Total no. of photons} = \frac{31580}{1.84 \times 10^{-24}}$$
$$= \underline{\underline{1.72 \times 10^{28} \text{ photons}}}$$