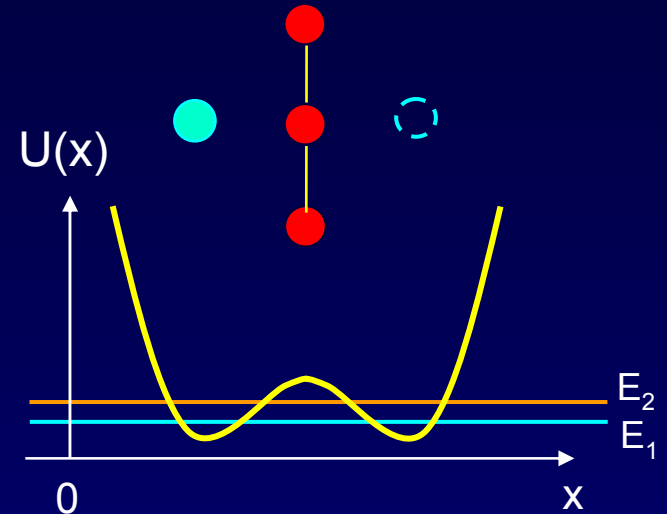


The Ammonia Maser

Stimulated emission of radiation between these two lowest energy states of ammonia ($\Delta E = 1.8 \times 10^{-4}$ eV) was used to create the ammonia maser, by C. Townes in 1954 (for which he won the Nobel prize in 1964).

What wavelength of radiation does the maser emit?



Solution:

By energy conservation, $E_2 - E_1 = E_{\text{photon}} = hc/\lambda$

$$\lambda = hc/(E_2 - E_1) = 1240 \text{ eV}\cdot\text{nm}/1.8 \times 10^{-4} \text{ eV} = 6.88 \times 10^6 \text{ nm} = 6.88 \text{ mm}$$

microwaves

The maser was the precursor to the laser. The physics is the same (more later).