This problem is about that old transcendental question: how long does it take to cook a chicken, and what is the science behind it?

(a) In a normal oven, heat radiated from the resistance heaters enters the chicken's surface and diffuses through its body, which is mostly water $\left(k = 0.68\ w/m/k,\ \rho = 1000 Kg/m^3,\ c = 4180 J/Kg/K)\right)$. Estimate the time for this heat diffusion through an "ideal spherical chicken" of R = 10 cm radius. Because the shape is spherical, the distance remaining to cover shrinks with time, so take an effective diffusion distance of $\frac{1}{2}R$. Compare to cooking times you may remember (~ 1 hr.), and comment on the implications, i.e., is the chicken almost isothermal during cooking?

(b) In a Microwave oven, heat is deposited throughout the chicken's volume, so diffusion is not an issue. Assuming the chicken has just been defrosted (T = 273K) and that it is "well done" at T = 373K, calculate the cooking time in a 1000W microwave oven.

(c) In view of these answers, what do you think of the cooking guidelines one sees in cookbooks, that say "so many minutes per lb"? Should they apply to one or both or these cases?