5. For a given quantum number n there are n possible values of l, ranging from 0 to $n-1$. For each l the number of possible electron states is $N_l = 2(2l+1)$ (see problem 2). Thus, the total number of possible electron states for a given n is

$$N_n = \sum_{l=0}^{n-1} N_l = 2\sum_{l=0}^{n-1}(2l+1) = 2n^2 \ .$$

   (a) In this case $n = 4$, which implies $N_n = 2(4^2) = 32$.
   (b) Now $n = 1$, so $N_n = 2(1^2) = 2$.
   (c) Here $n = 3$, and we obtain $N_n = 2(3^2) = 18$.
   (d) Finally, $n = 2 \rightarrow N_n = 2(2^2) = 8$.