12. (a) For $n = 3$ there are 3 possible values of l: 0, 1, and 2.

(b) We interpret this as asking for the number of distinct values for m_l (this ignores the multiplicity of any particular value). For each l there are $2l+1$ possible values of m_l. Thus the number of possible m_l's for $l = 2$ is $(2l+1) = 5$. Examining the $l = 1$ and $l = 0$ cases cannot lead to any new (distinct) values for m_l, so the answer is 5.

(c) Regardless of the values of n, l and m_l, for an electron there are always two possible values of m_s: $\pm\frac{1}{2}$.

(d) The population in the $n = 3$ shell is equal to the number of electron states in the shell, or $2n^2 = 2(3^2) = 18$.

(e) Each subshell has its own value of l. Since there are three different values of l for $n = 3$, there are three subshells in the $n = 3$ shell.