1. We assume that $L_1$ would be regular. Hence, by the pumping lemma there is a number $n$ such that we can split all words longer than $n$. Consider $w = a^nbc^{n+1}$, we have $|w| \geq n$ and $w \in L_1$. By the pumping lemma there is a splitting of the word $w = xyz$ s.t. $|xy| \leq n$. Hence $y$ may only contain as and it is not empty. Hence $xz = a^m bc^{n+1} \in L_1$ with $m < n$. However, this is clearly false since $m + 1 \neq n + 1$ and hence our assumption that $L_1$ is regular must have been wrong.

2. We assume that $L_2$ would be regular. Hence, by the pumping lemma there is a number $n$ such that we can split all words longer than $n$. Consider $w = 10^n10^n$, we have $|w| \geq n$ and $w \in L_2$. By the pumping lemma there is a splitting of the word $w = xyz$ s.t. $|xy| \leq n$ and hence $xy$ is a prefix of $10^n$ where $y$ is of the form $10^m$ or $0^m$ with $m < n$. In any case all the 1s in $xz$ are now in the first half of the word and hence $xz$ cannot be of the form $w = vv$ which contradicts the conclusion of the pumping lemma that $xz \in L_2$. Hence $L_2$ cannot be regular.

If $\Sigma$ contains only one letter than $L_2$ is the language of words with even length which is regular.