**HW # 1 Solution to part C**

let \( D = \{ A, C, G, T \} \). At any point in time a DNA segment \( l \) of length \( m \) is an element of \( D^m = D \times \cdots \times D \), where \( m \) times \( (m \) could be zero here, in which case \( D^m \) is just the empty string). Since insertions and deletions are allowed \( m \) may vary. Let \( S = \bigcup_{m=0}^{\infty} D^m \). This is the most general state space.

**Note:** An alternative representation of the state space is \( S = \{ l : l = (l_1, l_2, \ldots) \text{ and } l_j \in \mathbb{D} \} \).

s.t. \( j > j(l) \) \( l_j = 0 \) and for \( j < j(l) \) \( l_j \in \mathbb{D}^j \).

In the above setting \( l_j = 0 \) means that the \( j \)th slot is empty.

The assumption above that \( l_j \in \mathbb{D} \) for \( j < j(l) \) and \( l_j = 0 \) for \( j > j(l) \) is essential. This assumption ensures that each DNA segment has a unique representation.