



Assuming the earth is 4.5 billion years old, 10^{18} seconds, and atoms vibrate at 10^{13} Hz. Atoms vibrate 10^{31} times. There are 10^{50} atoms in the earth. Over earth's life, $10^{50} \times 10^{31}$ or 10^{81} possible atomic collisions (which can cause mutations).

A protein can have 900 base pairs. $4^{900} = 10^{541}$ possible combinations. Possibility of a protein of 900 base pairs forming randomly is $(10^{50} \times 10^{31}) / 10^{541} = 1 / 10^{460}$

The human genome of 3 billion base pairs has $10^{2\text{billion}}$ combinations, which is far greater than 10^{81} possible atomic collisions.

10^9 computers $\times$ 10^9 typing rate letters per minute $\times$ 10^{18} sec in age of universe $= 10^{36}$, will get the first 26 letters of Hamlet.