Define Moore's law and describe the physical limitations in devices that have stopped it from continuing to be true.

Moore's law is a term used to refer to the observation made by Gordon Moore in 1965 that the number of transistors in a dense integrated circuit (IC) doubles about every two years.

1. Heat Extraction and Thermal limits
   The more transistors there are on a chip, the more power it uses, the more heat it produces, and the greater the chance of a malfunction

2. Physical limits of the gate channel in transistors
   The way a transistor is made is there are a type of semiconductor sandwiched between another type. Since we are talking about electrons here, it is almost certain that each material type would need to be no less than an atom wide. Thus, there is a hard limit of 3 atoms for the gate channel length.

3. Power Consumption
   Higher number of transistors mean higher power consumption. Voltage scaling reduces power consumption.

4. Electric leakage
   Shrinking the size of transistors and the copper wires that connect them to fit more densely on a chip has also led to problems like electric leakage and increased power consumption. Voltage scaling cannot prevent leakage power loss.

5. Noise threatens Moore’s Law
   Any further increase in the density of computer chips means that they will reach a physical limit — due to thermal noise. These problems arise from a fundamental thermodynamical process — the increasing thermal or “Johnson-Nyquist” noise voltage. Voltage scaling is limited due to noise or threshold voltage.