Distinguish, differentiate, compare and explain what are the difference between SET and FET. Comparison and Differences.

Comparison and Difference between SET andÂ FET

Though the structure of Single electron transistors [SETs] is almost the same as that of MOSFETs (in terms of source, drain, and gate) still there are some differencesÂ between the SETs and MOSFETs. Lets see the similarities, comparison, and the difference between SET and Mosfet :

1. SETs have tunnel junction. In the case of MOSFETs, it is a p-n junction.
2. SET has a small conducting island [quantum dot]. FET has a channel region.
3. In SET, the tunneling electrons are transferred one-by-one through the island from source to drain due to the effect of Coulomb blockade. Due to the Coulomb blockade effect, an electron approaching a small negative charged region experiences the electrostatic repulsion by the previous electron in that region. This regulates the number of electrons one-by-one in the channel and hence the drain current varies accordingly. Whereas, in Mosfet, the number of electrons is transferred throughÂ the channel at a time. Thus many electrons simultaneously participate in the drain current.
4. In the case of SETs, the drain current (Id) does not depend on the number of electrons transferring through the channel or on the Fermi velocity. The Id-Vg characteristic of SET is periodic which shows a finite drain current only for the specific gate voltages where the energies for N and N+ 1 electron in the channel have degenerated. In the case of FETs, the drain current (Id) depends on the number of electrons passes through the channel. i.e. more electrons in the channel, larger the drain current.