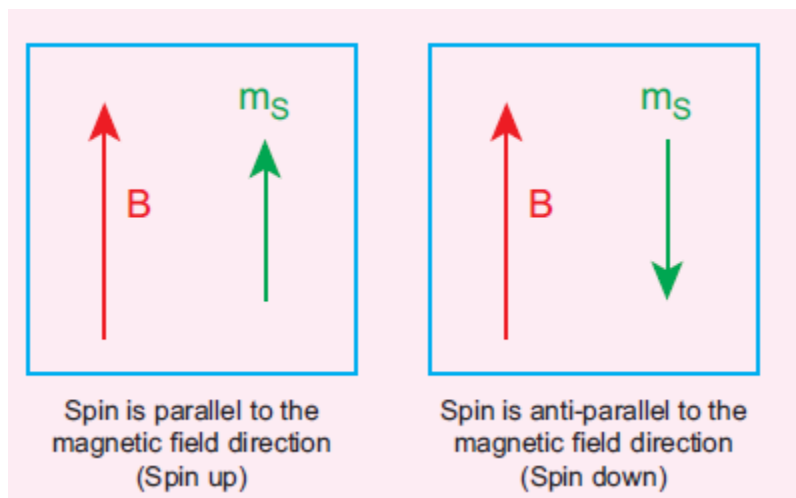


# Spin

Like mass and charge for particles, spin is also another important attribute for an elementary particle. Spin is a quantum mechanical phenomenon which is responsible for magnetic properties of the material. Spin in quantum mechanics is entirely different from spin we encounter in classical mechanics.

Spin in quantum mechanics does not mean rotation; it is intrinsic angular momentum which does not have classical analogue. For historical reason, the name spin is retained. Spin of a particle takes only positive values but the orientation of the spin vector takes plus or minus values in an external magnetic field. For an example, electron has spin  $s = \frac{1}{2}$ . In the presence of magnetic field, the spin will orient either parallel or anti-parallel to the direction of magnetic field.



This implies that the magnetic spin  $m_s$  takes two values for an electron, such as  $m_s = \frac{1}{2}$  (spin up) and  $m_s = -\frac{1}{2}$  (spin down). Spin for proton and neutron is  $s = \frac{1}{2}$  For a photon is spin  $s = 1$ .