

1st2nd3rd generation

electroweak

symmetry breaking

standard matter

unstable matter

force carriers

strong nuclear force (color)

electromagnetic force (charge)

weak nuclear force (weak isospin)

~ 2,2 MeV
+2/3
1/2
u
Up quark
γ WZ g h

1,275 GeV
+2/3
1/2
c
Charm quark
γ WZ g h

173,0 GeV
+2/3
1/2
t
Top quark
γ WZ g h

~ 4,7 MeV
-1/3
1/2
d
Down quark
γ WZ g h

~ 95 MeV
-1/3
1/2
s
Strange quark
γ WZ g h

4,18 GeV
-1/3
1/2
b
Bottom quark
γ WZ g h

mass → 0
charge → 0
spin → 1
g
Gluon
couplings →

511 keV
-1
1/2
e⁻
Electron
γ WZ h

105,7 MeV
-1
1/2
μ⁻
Muon
γ WZ h

1,777 GeV
-1
1/2
τ⁻
Tau
γ WZ h

0
0
1
γ
Photon
W

< 2,2 eV
0
1/2
ν_e
Electron neutrino
WZ

< 0,17 MeV
0
1/2
ν_μ
Muon neutrino
WZ

< 15,5 MeV
0
1/2
ν_τ
Tau neutrino
WZ

80,38 GeV
±1
1
W[±]
W[±] boson
γ WZ h

91,19 GeV
0
1
Z
Z boson
WZ h

12 fermions
(+12 antifermions)5 bosons
(W[±] → W⁺, W⁻)6 quarks
(+6 antiquarks)6 leptons
(+6 antileptons)