

three generations of matter
(fermions)

interactions / force carriers
(bosons)

I

II

III

mass
charge
spin

QUARKS

LEPTONS

$\approx 2.2 \text{ MeV}/c^2$

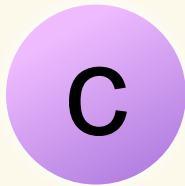
$\frac{2}{3}$
 $\frac{1}{2}$



up

$\approx 1.28 \text{ GeV}/c^2$

$\frac{2}{3}$
 $\frac{1}{2}$



charm

$\approx 173.1 \text{ GeV}/c^2$

$\frac{2}{3}$
 $\frac{1}{2}$



top

$\approx 4.7 \text{ MeV}/c^2$

$-\frac{1}{3}$
 $\frac{1}{2}$



down

$\approx 96 \text{ MeV}/c^2$

$-\frac{1}{3}$
 $\frac{1}{2}$



strange

$\approx 4.18 \text{ GeV}/c^2$

$-\frac{1}{3}$
 $\frac{1}{2}$



bottom

$\approx 0.511 \text{ MeV}/c^2$

-1
 $\frac{1}{2}$



electron

$\approx 105.66 \text{ MeV}/c^2$

-1
 $\frac{1}{2}$



muon

$\approx 1.7768 \text{ GeV}/c^2$

-1
 $\frac{1}{2}$



tau

$< 1.0 \text{ eV}/c^2$

0
 $\frac{1}{2}$



electron
neutrino

$< 0.17 \text{ MeV}/c^2$

0
 $\frac{1}{2}$



muon
neutrino

$< 18.2 \text{ MeV}/c^2$

0
 $\frac{1}{2}$



tau
neutrino

0
0
1



gluon

$\approx 124.97 \text{ GeV}/c^2$

0
0
0



higgs

0
0
1



photon

0
1



Z boson

$\approx 80.360 \text{ GeV}/c^2$

± 1
1



W boson

GAUGE BOSONS
VECTOR BOSONS

SCALAR BOSONS