

Standard Model of Elementary Particles

three generations of matter
(fermions)

interactions / force carriers
(bosons)

I

II

III

mass
charge
spin

$\approx 2.2 \text{ MeV}/c^2$
 $\frac{2}{3}$
 $\frac{1}{2}$
u
 up

$\approx 1.28 \text{ GeV}/c^2$
 $\frac{2}{3}$
 $\frac{1}{2}$
c
 charm

$\approx 173.1 \text{ GeV}/c^2$
 $\frac{2}{3}$
 $\frac{1}{2}$
t
 top

0
0
1
g
 gluon

$\approx 124.97 \text{ GeV}/c^2$
 0
0
H
 higgs

$\approx 4.7 \text{ MeV}/c^2$
 $-\frac{1}{3}$
 $\frac{1}{2}$
d
 down

$\approx 96 \text{ MeV}/c^2$
 $-\frac{1}{3}$
 $\frac{1}{2}$
s
 strange

$\approx 4.18 \text{ GeV}/c^2$
 $-\frac{1}{3}$
 $\frac{1}{2}$
b
 bottom

0
0
1
 γ
 photon

$\approx 0.511 \text{ MeV}/c^2$
 -1
 $\frac{1}{2}$
e
 electron

$\approx 105.66 \text{ MeV}/c^2$
 -1
 $\frac{1}{2}$
 μ
 muon

$\approx 1.7768 \text{ GeV}/c^2$
 -1
 $\frac{1}{2}$
 τ
 tau

$\approx 91.19 \text{ GeV}/c^2$
 0
1
Z
 Z boson

$< 1.0 \text{ eV}/c^2$
 0
 $\frac{1}{2}$
 ν_e
 electron
neutrino

$< 0.17 \text{ MeV}/c^2$
 0
 $\frac{1}{2}$
 ν_μ
 muon
neutrino

$< 18.2 \text{ MeV}/c^2$
 0
 $\frac{1}{2}$
 ν_τ
 tau
neutrino

$\approx 80.39 \text{ GeV}/c^2$
 ± 1
 1
W
 W boson

QUARKS

LEPTONS

GAUGE BOSONS
VECTOR BOSONS

SCALAR BOSONS