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The standard model of particle physics

The model describes the interplay of three forces — electromagnetic, weak and strong — and 12 elementary matter particles. (Gravity is not included.) Each force is mediated by the exchange of carrier particles: the photon, *W* or *Z* boson, or the gluon, as shown. Matter particles are divided into leptons and quarks, and, according to their mass hierarchy, line up into three 'generations'. Matter particles also have antimatter equivalents — such as the positron, which is an antielectron. For quarks, the antiparticles are typically represented by a bar placed over the letter that symbolizes them (for example, $\bar{u}$ is the antiparticle of the *u* quark). Collections of quarks and antiquarks form other, composite particles known as hadrons, a selection of which are shown. Hadrons are divided into mesons and baryons: mesons comprise a quark and an antiquark; baryons (including the proton and the neutron) are three-quark states.

Force	Carrier
Electromagnetic	Photon
Weak	$W^{\pm}$, Z
Strong	Gluon

	Leptons		Quarks	
	Electric charge −1	Electric charge 0	Electric charge $+^2/_3$	Electric charge $-^1/_3$
Three 'generations'	Electron e^-	Electron neutrino ν_e	Up u	Down d
	Muon μ^-	Muon neutrino ν_μ	Charm c	Strange s
	Tau τ^-	Tau neutrino ν_τ	Top t	Bottom b

Increasing mass

Hadrons			
Mesons Quark–antiquark states		**Baryons** Three-quark states	
π / ρ	$u\bar{d}$ / $\bar{u}d$ / $(u\bar{u} - d\bar{d})$	Proton (p), neutron (n)	uud, udd
η / φ	$(u\bar{u} - d\bar{d} + s\bar{s})$	Δ^{++}, Δ^-	uuu, ddd
K^0, $\bar{K}^0$	$d\bar{s}$, $\bar{d}s$	Λ^0	uds
K^+, K^-	$u\bar{s}$, $\bar{u}s$	Λ_c	udc
D^0, $\bar{D}^0$	$c\bar{u}$, $\bar{c}u$	Σ^0	uds
D^+, D^-	$c\bar{d}$, $\bar{c}d$	Σ^+, Σ^-	uus, dds
B^0, B_s^0	$d\bar{b}$, $s\bar{b}$	Ξ^0	uss
B^+, B^-	$u\bar{b}$, $\bar{u}b$	Ξ^-	dss
J/ψ	$c\bar{c}$	Ω^-	sss