

B.Sc-III, paper-VI, group-A (Nuclear physics)

Classification of elementary particles:-

Depending on their masses, interactions, statistics etc, elementary particles may be classified in a number of different ways.

They are mainly classified into three broad classes viz

(1) photons (2) leptons (3) hadrons.

Hadrons are further classified into two ~~two~~ groups.

(a) mesons (b) baryons.

Baryons are again subdivided into (i) Nucleons (ii) hyperons

Sl.No	particle (Symbol)	Mass (MeV/c ²)	Mean life (sec)	charge (in units of proton charge)	Spin (h)
1.	Photon (γ)	0	Stable	0	1h
2.	leptons				
	Electron (e^-)	0.51	stable	0	$\frac{1}{2}h$
	Electron neutrino (ν_e)	0	stable	0	$\frac{1}{2}h$
	muon (μ^-)	105.66	2.2×10^{-6}	-1	$\frac{1}{2}h$
	muon-neutrino (ν_μ)	0	stable	0	$\frac{1}{2}h$
	Tauon (τ^-)	1784.2	-	-1	$\frac{1}{2}h$
	Tauon neutrino (ν_τ)	0	stable	0	$\frac{1}{2}h$

Hadrons :-(i) Mesons :-

Particle (Symbol)	Mass (MeV/c ²)	Mean life (sec)	Charge (in units of proton charge)	Spin (h)
K ⁺	493.67	1.24 × 10 ⁻⁸	+1	0
K ⁻	"	"	-1	0
K ⁰	497.67	-	0	0
π ⁺	139.57	2.60 × 10 ⁻⁸	+1	0
π ⁻	"	"	-1	0
π ⁰	134.96	0.83 × 10 ⁻¹⁶	0	0
η ⁰	548.8	< 10 ⁻¹⁸	0	0

(ii) Baryons :-

<u>Nucleons</u>				
Proton (p)	938.928	Stable	+1	1/2 h
Neutron (n)	939.57	640	0	1/2 h
<u>Hyperons</u>				
Lambda (Λ ⁰)	1115.60	2.63 × 10 ⁻¹⁰	0	1/2 h
Sigma (Σ ⁺)	1189.36	0.80 × 10 ⁻¹⁰	+1	1/2 h
Sigma (Σ ⁻)	1197.34	1.88 × 10 ⁻¹⁰	-1	1/2 h
Sigma (Σ ⁰)	1192.34	5.8 × 10 ⁻²⁰	0	1/2 h
Xi (Ξ ⁰)	1314.9	2.90 × 10 ⁻¹⁰	0	1/2 h
Xi (Ξ ⁻)	1321.32	1.64 × 10 ⁻¹⁰	-1	1/2 h