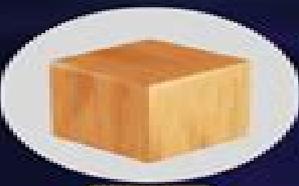


FUNDAMENTAL PARTICLES



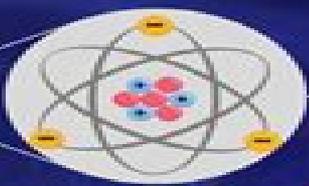
Matter

(All things are composed of atoms)



Molecule

(Matter is composed of molecules, which are groups of two or more atoms bonded together)



Atom

(Electrons orbit the positively charged nucleus of an atom)



Nucleus

Fundamental particles are classified into "**Bosons**" and "**Fermions**" based on their spin.

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BOSONS

Particles with **whole number spins** (0, 1, 2, etc.). They are energy and **force carriers** throughout the universe. They include **photons** (light), **gluons** (particles that act as force carriers in the nucleus), the **Higgs boson**, and the **W and Z bosons**.



Photons

Photons are massless, **charge-less** particles of light that travel at the speed of light.



Gluons

Gluons are **charge-less** particles that mediate the **strong nuclear force**, holding quarks together in protons and neutrons. They have color charges (red, green, blue) and are studied in high-energy environments like the **Relativistic Heavy Ion Collider (RHIC)**.



Higgs Boson

The Higgs boson, linked to the Higgs field, **gives mass to particles like electrons and quarks**. Mass determines a particle's resistance to force. **Photons**, which carry the electromagnetic force, **have no mass**.



W and Z Bosons

W and Z bosons are elementary particles with **spin 0 or 1**, discovered in 1983. They mediate the weak force, which is weaker than the strong force. There are two W bosons (W+ and its antiparticle W-), while Z bosons are their own antiparticles.

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Three Constituents of Matter (**Fermions**)

Force Carriers (**Bosons**)

Quarks

up u	charm c	top t
down d	strange s	bottom b

Leptons

electron e	muon μ	tau τ
electron neutrino ν _e	muon neutrino ν _μ	tau neutrino ν _τ

Gauge Bosons

photon γ	gluon g	Z Boson Z	W Boson W
-------------	------------	--------------	--------------

Scalar Bosons

Higgs Boson H

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FERMIONS

Particles with **half-number spins** (1/2, 3/2, etc.). They include protons, neutrons, electrons, neutrinos, and quarks.



- **Leptons** are fundamental particles that do not feel the **strong nuclear force**.
- **Electrons**, commonly found in atoms, are the most **well-known leptons**.
- There are six types of leptons:



Neutrinos

- **Neutrinos** are tiny, neutral particles with nearly undetectable mass.
- They are the **most abundant massive particles in the universe**.
- Produced during nuclear reactions in stars, reactors, and particle accelerators.
- **Bananas** emit neutrinos due to their natural radioactivity.



Gluon

Quarks



Neutron

Proton

- **Quarks** are the **building blocks** of protons and neutrons. They combine to form protons and neutrons.
- **Protons** and **neutrons** are **not** fundamental particles because they are composed of smaller particles called **quarks**.
- There are six types (flavors) of quarks:



Fundamental Particles

Clifford Lane



Fundamental Particles:

Embracing the Track of Appearance: An Psychological Symphony within **Fundamental Particles**

In a global consumed by displays and the ceaseless chatter of instant conversation, the melodic splendor and emotional symphony created by the prepared word usually diminish into the backdrop, eclipsed by the relentless sound and disruptions that permeate our lives. But, situated within the pages of **Fundamental Particles** a stunning literary treasure overflowing with organic feelings, lies an immersive symphony waiting to be embraced. Constructed by an outstanding musician of language, that interesting masterpiece conducts viewers on an emotional journey, well unraveling the concealed tunes and profound influence resonating within each carefully crafted phrase. Within the depths of the poignant analysis, we shall examine the book is central harmonies, analyze their enthralling writing model, and submit ourselves to the profound resonance that echoes in the depths of readers souls.

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