

Lecture 3 : Elementary particle dynamics - 1

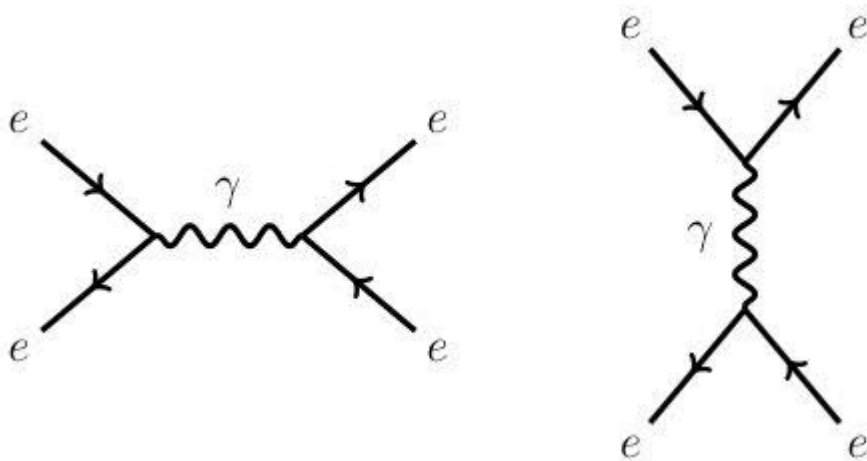
There are four fundamental forces of nature as far as we know today.

Each of them is based on a physical theory, gravitational force has a classical theory the others have quantum theories based on local gauge interactions.

<u>Forces</u>	<u>Strength</u>	<u>Theory</u>	<u>Mediator</u>
Strong	10	QCD	Gluons
Electromagnetic	10^{-2}	QED	Photons
Weak	10^{-13}	Weak interactions	W and Z bosons
Gravitational	10^{-44}	Quantum gravity ?	Gravitons
		Newton theory	No mediator but Action at a distance
		Einstein theory	No mediator It is spacetime curvature

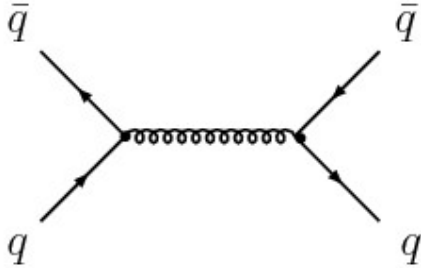
Quantum electrodynamics :

Feynman diagrams for electron-electron scattering via one photon exchange.



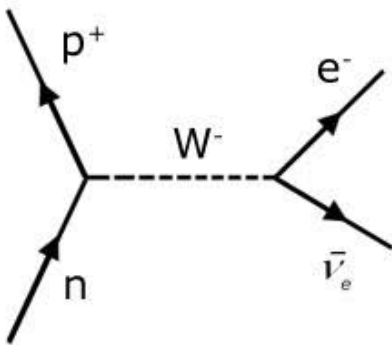
Quantum chromodynamics :

A possible Feynman diagram for quark-antiquark scattering via one gluon exchange.

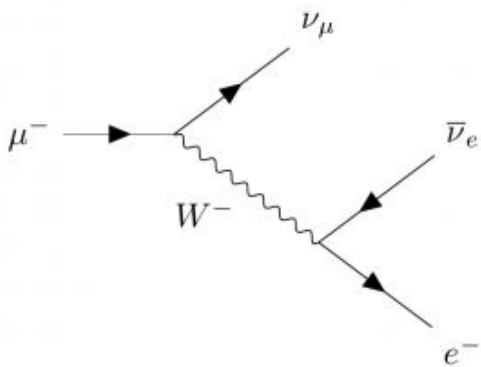


Weak interactions :

Feynman diagram for the neutron beta decay via weak W boson.



Feynman diagram for the muon decay



Homework

Solve the following problems at the end of the Chapter II of the textbook by D.Griffiths “Introduction to Elementary Particles J.Wiley)

Solve Problem 2.1

Solve Problem 2.2

Solve Problem 2.3

Solve Problem 2.4

Solve Problem 2.5

Solve Problem 2.6