

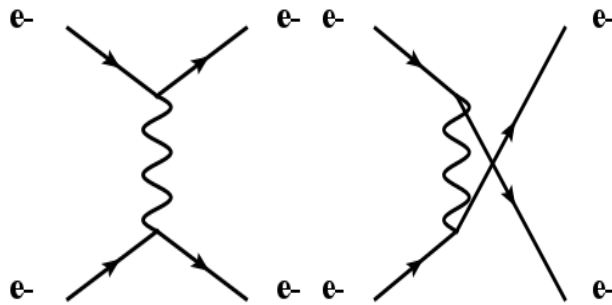
Thomson 1.6

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1.6.a

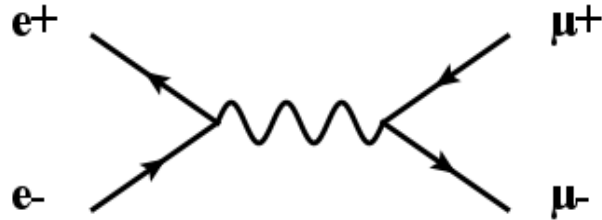
$$e^-e^- \rightarrow e^-e^-$$



In this case we have only t and u channel interactions. The propagator can be a photon, W boson or Z boson. We need the u channel diagram because we have identical particles as the result of the scattering.

1.6.b

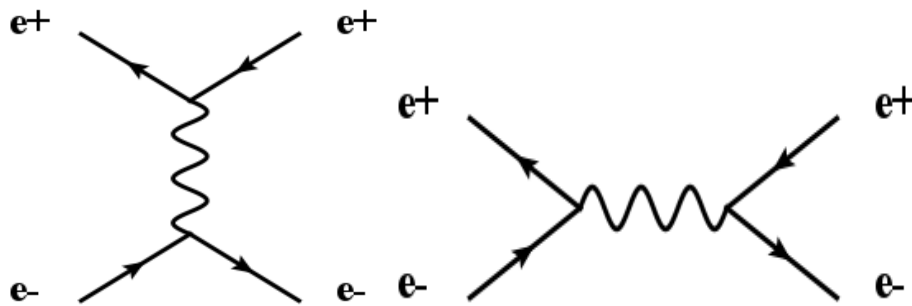
$$e^+e^- \rightarrow \mu^+\mu^-$$



The electron and positron will annihilate creating a photon, W boson or Z boson that will then decay into the muon and antimuon. The only channel we can get is the s channel since the left side and right side do not share the same particle.

1.6.c

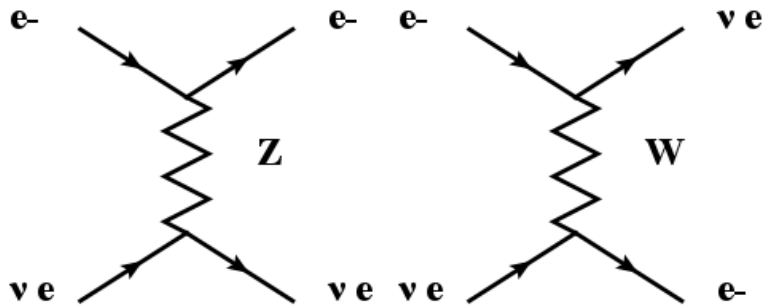
$$e^+e^- \rightarrow e^+e^-$$



We will have both s and t channel interactions for this interaction. The propagator can be a W boson, a Z boson, or a photon for the t channel interaction. The propagator can be a Z boson or a photon for the s channel interaction.

1.6.d

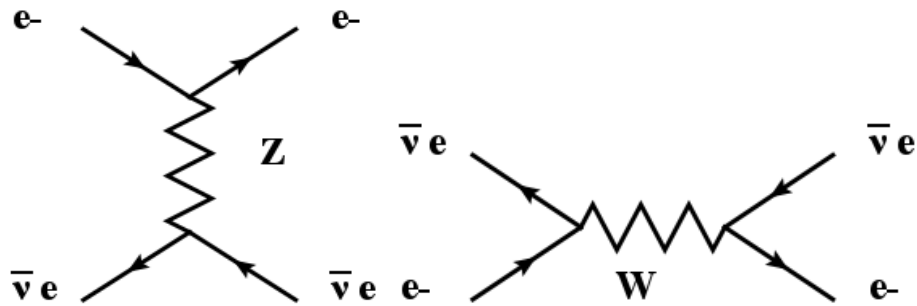
$$e^- \nu_e \rightarrow e^- \nu_e$$



For this interaction we have t channel interactions with either a Z boson or a W boson. The photon can no longer be the propagator since neutrinos have no electric charge.

1.6.e

$$e^- \bar{\nu}_e \rightarrow e^- \bar{\nu}_e$$



In this interaction we can either have an s channel interaction with a Z boson as the propagator or a s channel interaction with a W boson as the propagator.