Thomson 1.1

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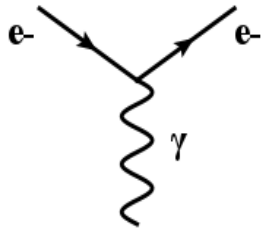
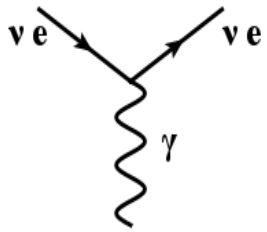
27Dec19

1.1.a



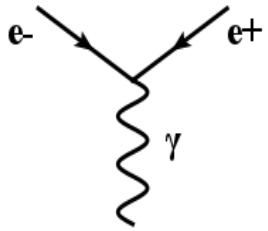
This is allowable as electrons carry electric charge, and therefore couples to the photon.

1.1.b



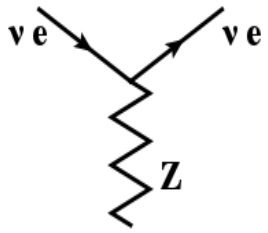
This is not allowable as neutrinos have no charge. Only charged particles couple with the photon.

1.1.c



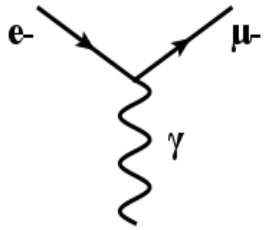
This is not allowed as there is no charge conservation. A particle can't just transform into an antiparticle, and the arrows violate Feynman diagram rules for vertices.

1.1.d



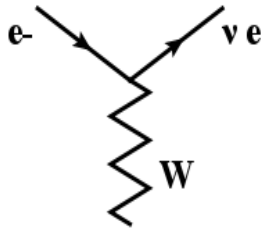
This is allowable as neutrinos couple with the Z boson, and there is no flavor change for the neutral weak interaction.

1.1.e



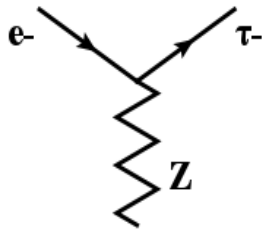
This is not allowable as particles can't change flavor through electromagnetic interactions.

1.1.f



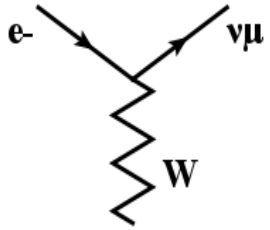
This is allowable as the electron couples with the W boson and there is the required flavor change.

1.1.g



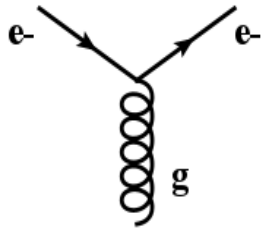
This is not allowable as the neutral weak interaction cannot cause a change of flavor.

1.1.h



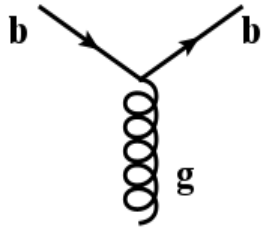
This is not allowable as the "weak partner" of the electron is the electron-neutrino, not the muon-neutrino.

1.1.i



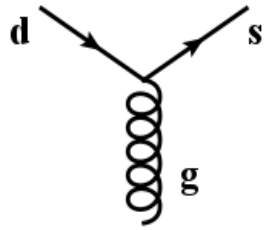
This is not allowable because electrons to not have color charge and therefore do not couple with gluons.

1.1.j



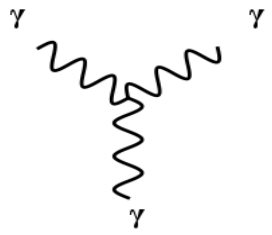
This is allowable as bottom quarks carry color charge and there is no flavor change in this interaction.

1.1.k



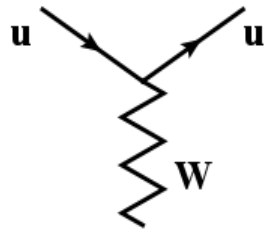
Although down quarks and strange quarks both carry color charge, the strong interaction cannot change a particle's flavor so this interaction is not allowed.

1.1.l



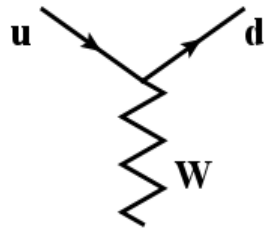
Photons are chargeless and cannot couple to themselves so this interaction is not allowed.

1.1.m



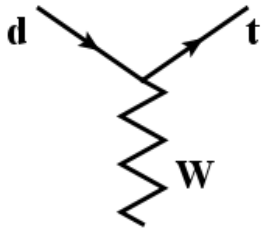
This is not allowed as there is no required flavor change in this interaction.

1.1.n



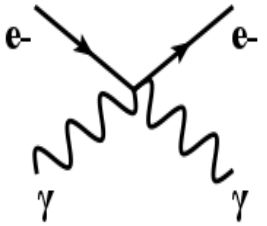
This is allowable as quarks couple to the W boson and there is the required flavor change of an up quark to a down quark.

1.1.o



This is allowable as quarks couple to the W boson and there is the required flavor change.

1.1.p



This is not allowed as there is no vertex in QED that allows more than one photon.