Thomson 1.5

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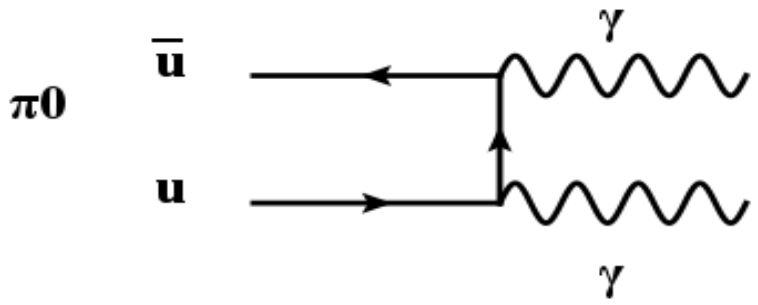
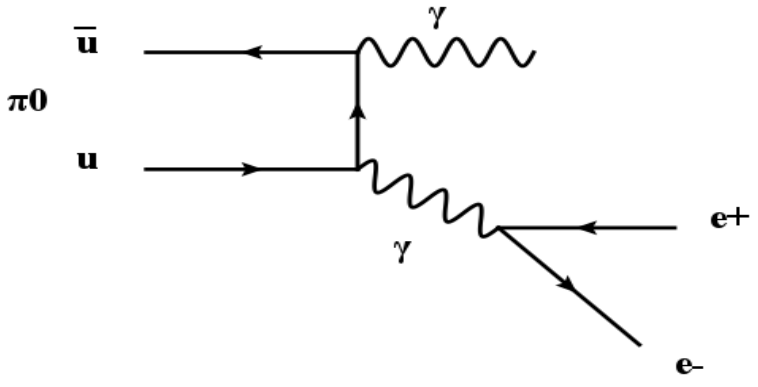
1.5.a

$\pi^0 \to \gamma\gamma$



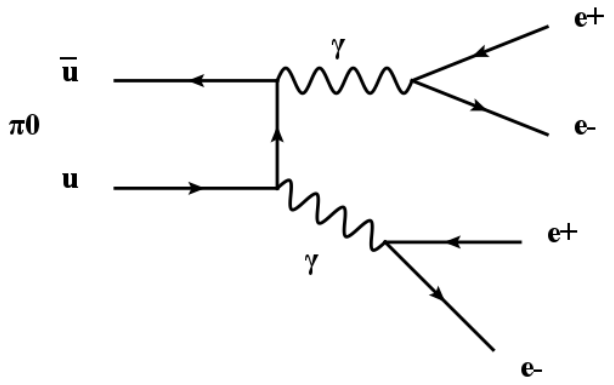
1.5.b

$\pi^0 \to \gamma e^+ e^-$



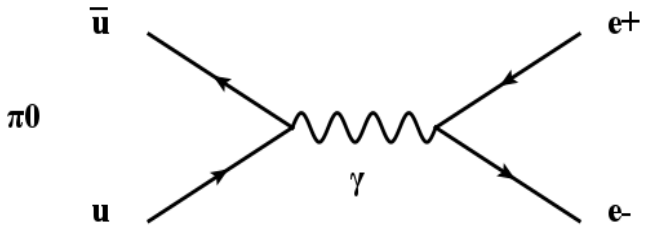
1.5.c

$\pi^0 \to e^+e^-e^+e^-$



1.5.d

$\pi^0 \to e^+e^-$



Relative Decays We can use these diagrams to determine the relative decay rates of each of the decay paths. Every vertex picks up an α^2, so higher ordering diagrams end up being a lot smaller in the case of $\alpha < 1$. Since all of these decays are electromagnetic decay paths, we can look at the α for QED ($\alpha = 1/137$). Let us say the decay rate of part a is 1. In other words, we are going to multiply every decay rate by α^4. The decay of part b has the same number of vertices so it would have a decay rate of 1. The decay of part b has three vertices, so would have a strength of about α^6. This would give it a relative value of about 1/18769. The decay path in part c has 4 vertices or a strength of about α^8. This would give it a relative decay rate of 1/352275361. As we can see, the higher order feynman diagrams in QED add little to the overall decay rate of a particle, so we can often ignore all decay paths except the lowest order diagrams.