

1. Fill in the information below for the basic Fermions (Quarks and Leptons)

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| Quark Name | Symbol | Electric Charge |
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| Lepton Name | Symbol | Electric Charge |
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1. Protons and Neutrons are made of up and down quarks. If the charge of a proton is +1e and the charge of a neutron is 0, write below what protons and neutrons are made of.

Proton: Neutron:

1. What type of particle is composed of 3 quarks?
2. What type of particle is composed of 2 quarks (1 quark and 1 antiquark)
3. When you have beta minus decay, a neutron turns into a proton. Can we be more specific about what particle changes?

Conservation Rules

1. State below the 7 conservation laws that physicists currently agree on.
2. Circle below the decay equations that violate the conservation laws:

$$n\rightarrow p+e^{-}+\overbar{υ}\_{e}$$

$$n\rightarrow p+e^{-}$$

$$p+n\rightarrow p+p+\overbar{p}$$

$$e^{-}+\overbar{e}^{+}\rightarrow γ$$

$$p\rightarrow n+\overbar{e}^{+}+υ\_{e}$$

$$p\rightarrow n+\overbar{e}^{+}$$

$$μ^{-}\rightarrow γ+e^{-}$$

$$p+n\rightarrow p+π^{0}$$

$$p+π^{-}\rightarrow n+π^{0}$$

1. When two electrons approach each other, what Boson is the force carrier that results in them repelling each other?
2. Occasionally, high energy muons collide with electrons and produce two neutrinos according to the reaction $μ^{+}+e^{-}\rightarrow 2υ$. What kind of neutrinos are they?
3. I have 1 L of water (1 kg). If water has a molar mass of 18.01528 g/mol, and assuming it is neutrally charged, how many electrons, up quarks and down quarks exist in that container?