SPH4U1 Task – Elementary Particles Name: Sol'n

The following questions are about elementary particles.

1. State what is meant by an elementary particle, and what are the three types?

Smallest known particles 1. Boson (Force/Exchge particle) 2. Lepton 3. Quark (Hadrons or Baryon & Mesons)

2. List the four forces, and their carriers. What are their relative strengths, and their ranges?

Gravity – graviton – weakest 10^{-39} – infinite range
Electromagnetic – photon – strong 10^{-2} – infinite range
Weak Nuclear – W & Z Boson – weak 10^{-10} – 10^{-18} m range
Strong Nuclear – gluon – strongest 1 – 10^{-15} m range

3. List which forces electrons are influenced by. Electromagnetic, Weak Nuclear, Gravity

4. List which forces quarks are influenced by. Strong Nuclear (mostly), Weak Nuclear, Gravity

The following questions are about hadrons.

5. List the two types of hadron. Baryon (3 quarks) & Meson (2 quarks)

6. What is the quark makeup of a baryon? Use the symbol "q" for quark and "$\bar{q}$" for antiquark.

qqq – three quarks

7. What is the quark makeup of a meson? Use the symbol "q" for quark and "$\bar{q}$" for antiquark.

$q\bar{q}$ – a quark and an anti quark

The following questions are about the standard model.

10. State the three-family structure of quarks in the standard model. Be sure to list the family number and the particles within that family.

Family	#1	#2	#3
	Up	Charm	Top
	Down	Strange	Bottom

11. State the three-family structure of leptons in the standard model. Be sure to list the family number and the particles within that family.

Family	#1	#2	#3
	electron	muon	Tauon
	electron neutrino	muon Neutrino	Tauon Neutrino

12. What is the Higgs particle (or Higgs boson)? (from video)

Force carrier for the Higgs Field.

13. What is the significance of the Higgs boson in the context of the standard model? (from video)

The Higgs Boson would validate the Higgs field.
The Higgs Field gives "mass" to all other particles.