What You Should Know

1.) What, in general, is the Standard Model?

2.) What are the two general kinds of particles found in the Standard Model?

3.) What is the main characteristic of Fermions?

4.) What is the main characteristic of Bosons?

5.) Fermions are broken into two kinds of particles, quarks and leptons. Give an example of a lepton?

6.) Give an example of a Boson?

7.) There are six kinds of quarks. Name them.

8.) Only two quarks are used to make up the particles that make up our universe. The others are similar but different.

a.) Which two make up our universe?

b.) What makes the other quarks different?

11.) Which is the weakest of the four fundamental forces?

12.) Which is the strongest of the four fundamental forces?

13.) What force has the longest range (and how long is it)? (there could be more than one)

14.) What force has the shortest range (and how short is it)?

15.) What is the force intermediary for each of the four fundamental forces, and what do the intermediaries act on (that is, the photon acts on things that have electrical properties, etc.)?

16.) If a force intermediary acts for only a very short period of time, what can you say about its mass/energy?

17.) What is the name of the theory that governs how gluons interact with quarks? (this is a great “cocktail party” question and will surely be on your test).

18.) The binding energy between two protons via the strong interaction is around 25 MeV. The electromagnetic repulsion between two protons in this bound state has an energy equivalent of around 24 MeV. So how much energy would be required to split two bound protons in a nucleus?

19.) Which of the force intermediaries do we need to observe via secondary phenomenon? That is, which lives for such a short time that they can't be direclty observed?

20.) What is the quark make-up of a proton? a neutron?

21.) An atom with "too many" neutrons can beta decay, emitting a W-boson that almost immediately turns into a high energy electron (called a beta particle) and a nearly massless anti-neutrino. When the neutron executes that emission, what happens to its quarks distribution? That is, be able to explain what really happens when "beta decay" occurs.

22.) How much stronger is the strong force than gravity? (more cocktail trivia)