Quiz 6; Phys 100 Name ______________

1. (4 points) How do we know that the strong nuclear force exists?

(a) Neutrons do not respond to gravitational forces

(b) Protons exist together in an atomic nucleus

(c) Electrons keep far away from atomic nuclei

(d) Neutrinos pass through the Earth as if it wasn't there

(e) Quark interactions with muons have a large time scale

2. (4 points) You have a radioactive sample with mass 4.0 kg, composed of an isotope that has a half-life of 6.0 days. If you check after 10.0 days, what will the mass of the remaining radioactive isotope be? (You don't need to perform a calculation here!)

(a) 1.3

(b) 5.9

(c) 0.6

(d) 2.3

(e) 2.0

3. (4 points) Individual quantum events, such as the decay of a nucleus, happen randomly. How, then, is it possible to count on exactly 2.00 kg of an originally 4.00 kg radioactive isotope remaining in a sample after one half-life passes? If it's all random, why couldn't we end up with 1.00 kg after a half-life, or 3.00 kg?

Answer: There are *huge* numbers of particles in everyday objects. As the population of objects grow, deviations from the average behavior become increasingly unlikely for the population as a whole. The probability that half of the 4.00 kg of radioactive nuclei will end up surviving, ending up very very close to the average value of 2.00 kg, is extremely high. Ending up with 1.00 kg or 3.00 kg is not technically impossible, but for all practical purposes, it will not happen.

4. (4 points) Which of the following processes manufactures some of the elements in the periodic table?

(a) Chemical reactions

(b) Inverted electromagnetic spectrum-dependent cryolapsis

(c) High pressure at the core of Earth-like planets

(d) Encounters with gamma radiation in outer space

(e) Explosions of stars that have used up their nuclear fuel

5. (4 points) What is responsible for astronomical objects tending to have spherical shapes?

(a) Radioactive decay

(b) Gravity

(c) Magnetism

(d) The strong nuclear force

(e) Half-lives