(10.6) (a) What are bosons and how do they differ from fermions? (b) Does the difference have any practical consequence?

(a) Bosons are a group of "particles" to which the photon and mesons belong. The bosons are the carriers of forces. When two fermions interact they continually emit and absorb bosons. The bosons have an even spin (0, 1, etc), they do not obey the Pauli principle, and they do not require the formation of anti-particles in their reactions.

Particles of non-integral spin are called fermions because they obey the statistical rules devised by Fermi and Dirac, which state that two such particles cannot exist in the same closed system (nucleus or electron shell) having all quantum numbers the same (referred to as the Pauli principle). Fermions are the building blocks of nature. Fermions can be created and destroyed only in conjunction with an anti-particle of the same class. For example if an electron is emitted in β-decay it must be accompanied by the creation of an anti-neutrino. Conversely, if a positron - which is an anti-electron - is emitted in the β-decay, it is accompanied by the creation of a neutrino.

(b) Answer is included in, and follows from, answer to (a)