1. Williams 10.3
2. Williams 10.9

3. In Williams, Fig. 10.21, there appear to be 13 mesons. The center dot actually corresponds to 4 different mesons, so there are really 16. Make a table and give the valence quark content of each state. Also specify the strangeness, charm, and isotopic spin quantum numbers.

4. An unusual meson can be formed from a bottom and charmed quark in analogy with the $\pi$ or $K$ meson. It would be called the $B_c$. Describe such a particle and its antiparticle, giving all of its quantum numbers (spin, parity, charm, beauty) and estimate its mass. Given that the $b$ quark decays predominantly to a $c$ quark in a manner analogous to beta decay, suggest a decay channel that involves the $J/\psi$ (charmonium) state, and estimate the $Q$ value for the decay.