8.811 Particle Physics
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Fall, 2005

Assignment 1,
Due in class at 11:00AM, Sept. 26

1. Prob. 2.3 in Q&L. Nuclear forces and then also Matrix A are independent
   of isospin.

2. Prob. 2.6 in Q&L. Define the eigenstates and then use the lowering and
   raising operators to define J_2 for $J = 1/2$ and 1 respectively. Expand the
   exponential like that in 2.7 of Q&L. Save the rotation matrices for
   computing the angular distributions of various cross sections later.

3. Use the symmetric spin-flavor wave functions of the ground state
   baryons to find the ratio of the abnormal magnetic dipole moments of a
   proton and a neutron. Why are they referred as abnormal? How were they
   measured?

4. Derive the ratio in Prob. 2.21 in Q&L using two methods: first by
   computing the magnetic dipole transition amplitudes after showing both
   transitions are magnetic dipole transition; second, using the results of
   2.25 and the vector meson dominance model.

5. Prob. 2.25 in Q&L. Show that ϕ is not an SU3 singlet. Express that ϕ as a
   mixed state of the SU3 singlet and triplet.

6. Prob. 2.27 in Q&L. First explain why the charge conjugation of a photon
   or a gluon is -1. Then use colored pens to draw the color flow diagrams
   in the decays.