

Problem Set 4

Physics 363
Apr. 23, 2008

Spring Quarter 2008
Due in class Wed. Apr. 30.

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Reading: Perkins Review Chapter 4: in particular:

1. The wavefunctions for the baryon decuplet and octet
2. The wavefunctions for the pseudoscalar and vector meson octets
3. Hyperfine splitting in the baryon masses
4. The Coleman-Glashow relation for electromagnetic splitting of the baryon masses.
5. The magnetic moments of the baryons;

and (new) Chapter 5, Sections 5.1 and 5.2.

To learn the group theory underlying a lot of this, I recommend the book by WuKi Tung, 'Group Theory in Physics' (available in paperback).

Problems:

1. Perkins Chapter 4, Problem 4.2
2. Perkins Chapter 4, Problem 4.3
3. Perkins Chapter 4, Problem 4.6
4. Perkins Chapter 4, Problem 4.7
5. Calculate the predicted hyperfine mass splittings in Perkins Table 4.1
6. Calculate the predicted magnetic moments in Perkins Table 4.12
7. Derive the formulae 5.4 and 5.5 in Perkins Chapter 5.
8. What are the effects that limit the precision of the mass and magnetic moment predictions of the Static Quark Model (i.e. how precise do we expect them to be?)