

Due Date: 10-08-08

## Nuclear Physics 621

### Homework 3 - QCD

Send your answer to:  
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Which of these reactions is allowed, and what are the forces (strong, weak, e.m.) that govern them ?

- 1)  $p + \bar{p} \rightarrow \pi^+ + \pi^-$
- 2)  $\pi^0 \rightarrow \gamma + \gamma$
- 3)  $p + \pi^0 \rightarrow \Delta^+$
- 4)  $K^- \rightarrow \pi^+ + \pi^0$
- 5)  $\Sigma^0 \rightarrow \Lambda^0 + \pi^0$
- 6)  $\mu^- \rightarrow e^- + \bar{\nu}_e$
- 7)  $n + \bar{n} \rightarrow \pi^+ + \pi^- + \pi^0$
- 8)  $e^+ + e^- \rightarrow \mu^+ + \mu^-$
- 9)  $p \rightarrow e^+ + \gamma$
- 10)  $\Sigma^+ \rightarrow p + \gamma$

Which conservation laws prevent the reactions that are not allowed?

- Hints:**
- 1) Remember that weak interaction can mix quark flavors
  - 2) In some cases, several forces can participate to the reaction