

Particle Physics - Exercises

2. The Quark Model of Elementary Particles

1. Which of the following strong production processes are allowed ?
For forbidden processes give the violated quantity !

$$\mathbf{p \bar{p} \rightarrow \pi^+ \pi^- \pi^0} \quad [1]$$

$$\mathbf{p \bar{p} \rightarrow \Sigma^+ \Sigma^-} \quad [1]$$

$$\mathbf{\gamma p \rightarrow \pi^+ n} \quad [1]$$

$$\mathbf{\pi^- p \rightarrow K^0 n} \quad [1]$$

2. Which of the following decays are allowed ?

For allowed decays quote the interaction which mediates the decay !
For forbidden decays quote the violated quantity !

$$\mathbf{\mu^- \rightarrow e^- e^+ e^-} \quad [1]$$

$$\mathbf{K^+ \rightarrow \pi^0 e^+ \nu_e} \quad [1]$$

$$\mathbf{p \rightarrow e^+ \pi^0} \quad [1]$$

$$\mathbf{n \rightarrow p e^- \gamma} \quad [1]$$

$$\mathbf{p \rightarrow n e^+ \nu_e} \quad [1]$$

$$\mathbf{\Lambda^0 \rightarrow p K^-} \quad [1]$$

3. If the following strong reactions or decays are allowed draw the quark diagrams!
For forbidden processes give the violated quantity!

$$\mathbf{\Phi^0 \rightarrow K^+ K^-} \quad [1]$$

$$\mathbf{\Phi^0 \rightarrow \pi^+ \pi^- \pi^0} \quad [1]$$

$$\mathbf{\Phi^0 \rightarrow e^+ e^-} \quad [1]$$

$$\mathbf{\pi^- p \rightarrow K^0 \Lambda^0} \quad [2]$$

$$\mathbf{K^- p \rightarrow \pi^0 \Lambda^0} \quad [2]$$