

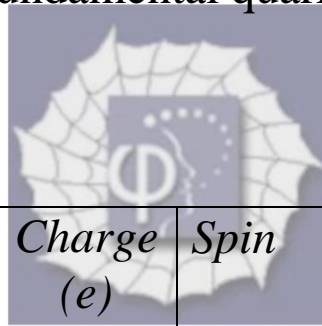
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Problem 56.21 (RHK)

We have to explain using quark model why there are no known mesons with $Q = +1$ and $S = -1$ or with $Q = -1$ and $S = +1$.

Solution:

Properties of the fundamental quarks are as given in the following table:



<i>Quark</i>	<i>Symbol</i>	<i>Charge</i> <i>(e)</i>	<i>Spin</i>	<i>Baryon</i> <i>Number</i>	<i>Strangeness</i>
Up	u	$+\frac{2}{3}$	$\frac{1}{2}$	$\frac{1}{3}$	0
Down	d	$-\frac{1}{3}$	$\frac{1}{2}$	$\frac{1}{3}$	0
Strange	s	$-\frac{1}{3}$	$\frac{1}{2}$	$\frac{1}{3}$	-1

The charge, baryon number, and strangeness of \bar{u} , \bar{d} , and \bar{s} are opposite of u, d, and s, respectively.

Mesons have baryon number 0, therefore they comprise of one quark and one anti-quark. A meson with charge $Q = +1$ can either be the combination $u\bar{d}$, or $u\bar{s}$. The strangeness of $u\bar{d}$ is 0 and that of $u\bar{s}$ is +1. Therefore, there is no known meson with $Q = +1$ and $S = -1$.

Meson with $Q = -1$ has to be the quark combination $\bar{u}d$ or $\bar{u}s$. The strangeness of $\bar{u}d$ is zero and that of $\bar{u}s$ is -1. Therefore, there is no known meson with $Q = -1$ and $S = +1$.

