914.

Problem 56.20 (RHK)

Using the up, down, and strange quarks only, we have to construct, if possible, a baryon (a) *with* $Q = +1$ *and* $S = -2$; (b) *with* $Q = +2$ *and* $S = 0$.

Solution:

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

Quark	*Symbol*	*Charge (e)*	*Spin*	*Baryon Number*	*Strangeness*
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

(a)

A baryon will comprise of three quarks. We note that a baryon with strangeness $S = -2$ has to necessarily have

out of the three quarks two s, which will have charge $-\frac{2}{3}$.

Therefore, a baryon with $Q = +1$ and $S = -2$ is not possible.

(b)

A baryon with $Q = +2$ and $S = 0$ will be the three quark combination uuu.