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Sample Fermionic Hadrons

Baryons (qqq) and Anti-baryon ($\overline{qqq}$)

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Commonly Stated Reaction	Proposed Reaction Statement	Balanced (qmsc) Description
$n^0 \to p^+e^-\nu_e$	$n^0 \to p^+e^-\nu_e$	(01-1-1)→(10-1-1)+(-1000)+(0100)
$\Lambda^0 \to p^+\pi^-$	$\Lambda^0 \to p^+\pi^-(\nu_\mu\nu_e)$	(000-1)→(10-1-1)+(-1100)+(0-100)+(0010)
$\Lambda^0 \to n^0\pi^0$	$\Lambda^0 \to n^0\pi^0(\nu_\mu\nu_e)$	(000-1)→(01-1-1)+(0000)+(0-100)+(0010)
$\Sigma^0 \to \Lambda^0\gamma$	$\Sigma^0 \to \Lambda^0\gamma$	(000-1)→(000-1)+(0000)
$\Sigma^+ \to p^+\pi^0$	$\Sigma^+ \to p^+\pi^0(\nu_\mu\nu_e)$	(1-10-1)→(10-1-1)+(0000)+(0-100)+(0010)
$\Sigma^+ \to n^0\pi^+$	$\Sigma^+ \to n^0\pi^+(\nu_\mu\nu_e)$	(1-10-1)→(01-1-1)+(1-100)+(0-100)+(0010)
$\Sigma^- \to n^0\pi^-$	$\Sigma^- \to n^0\pi^-(\nu_\mu\nu_e)$	(-110-1)→(01-1-1)+(-1100)+(0-100)+(0010)
$\Xi^0 \to \Lambda^0\gamma$	$\Xi^0 \to \Lambda^0\gamma(\nu_\mu\nu_e)$	(0-11-1)→(000-1)+(0000)+(0-100)+(0010)
$\Xi^- \to \Lambda^0\pi^-$	$\Xi^- \to \Lambda^0\pi^-(\nu_\mu\nu_e)$	(-101-1)→(000-1)+(-1100)+(0-100)+(0010)
$\Omega^- \to \Lambda^0K^-$	$\Omega^- \to \Lambda^0K^-(\nu_\mu\nu_e)$	(-1-12-1)→(000-1)+(-1010)+(0-100)+(0010)
$\Omega^- \to \Xi^0\pi^-$	$\Omega^- \to \Xi^0\pi^-(\nu_\mu\nu_e)$	(-1-12-1)→(0-11-1)+(-1100)+(0-100)+(0010)
$\Omega^- \to \Xi^-\pi^0$	$\Omega^- \to \Xi^-\pi^0(\nu_\mu\nu_e)$	(-1-12-1)→(-101-1)+(0000)+(0-100)+(0010)

Commonly Stated Reaction	Proposed Reaction Statement	Balanced (qmsc) Description
$K^- \to \mu^-\nu_\mu$	$K^- \to \mu^-\nu_\mu(\nu_\mu\nu_e)$	(-1010)→(-1110)+(00-10)+(0010)+(0-100)
$K^- \to \mu^-\pi^0\nu_\mu$	$K^- \to \mu^-\pi^0\nu_\mu(\nu_\mu\nu_e)$	(-1010)→(-1110)+(0000)+(00-10)+(0010)+(0-100)
$K^- \to e^-\pi^0\nu_e$	$K^- \to e^-\pi^0\nu_e(\nu_\mu\nu_e)$	(-1010)→(-1000)+(0000)+(0100)+(0-100)+(0010)
$K^- \to \pi^-\pi^0$	$K^- \to \pi^-\pi^0(\nu_\mu\nu_e)$	(-1010)→(-1100)+(0000)+(0010)+(0-100)
$K^- \to \pi^-\pi^+\pi^-$	$K^- \to \pi^-\pi^+\pi^-(\nu_\mu\nu_e)$	(-1010)→(-1100)+(1-100)+(-1100)+(0010)+(0-100)
$K^0 \to \pi^-\pi^+\pi^0$	$K^0 \to \pi^-\pi^+\pi^0(\nu_\mu\nu_e)$	(0-110)→(1-100)+(-1100)+(0000)+(0010)+(0-100)
$K^0 \to \pi^+e^-\nu_e$	$K^0 \to \pi^+e^-\nu_e(\nu_\mu\nu_e)$	(0-110)→(1-100)+(-1000)+(0100)+(0-100)+(0010)
$K^0 \to \pi^-\pi^+$	$K^0 \to \pi^-\pi^+(\nu_\mu\nu_e)$	(0-110)→(1-100)+(-1100)+(0010)+(0-100)

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Commonly Stated Reaction	Proposed Reaction Statement	Balanced (qmsc) Description
$D^0 \rightarrow K^-\pi^+$	$D^0 \rightarrow K^-\pi^+(\nu_e\nu_\mu)(\nu_e\nu_\tau)$	(010-1) →(-1010)+(1-100)+2x(0100)+(00-10)+(000-1)
	or	or
	$D^0 \rightarrow y^0(\nu_e\nu_\mu)$	(010-1) →(001-1)+(0100)+(00-10)
	then	then
	$y^0 \rightarrow K^-\pi^+(\nu_e\nu_\tau)$	(001-1) →(-1010)+(1-100)+(0100)+(000-1)
$D^0 \rightarrow K^0\pi^+\pi^+\pi^-\pi^-$	$D^0 \rightarrow K^0\pi^+\pi^+\pi^-\pi^-(\nu_\mu\nu_\tau)$	(0-101) →(0-110)+2x(1-100)+2x(-1100)+(00-10)+(0001)
$\varphi \rightarrow \phi\,\gamma$	$\varphi \rightarrow \phi\,\gamma\,(\nu_e\nu_\tau)$	(0000) →(010-1)+(0-100)+(0001)
$B^- \rightarrow D^0\pi^-$	$B^- \rightarrow D^0\pi^-(\nu_e\nu_\mu)$	(-111-1) →(010-1)+(-1100)+(0-100)+(0010)
$B^0 \rightarrow D^0\pi^+\pi^-$	$B^0 \rightarrow D^0\pi^+\pi^-(\nu_e\nu_\mu)$	(00-11)(0-101) →(1-100)+(-1100)+(0100)+(00-10

Commonly Stated Reaction	Proposed Reaction Statement	Balanced (qmsc) Description
$\nu_\mu+p^+ \rightarrow \Sigma_c^{++}\mu^-$	$\nu_\mu+p^+ \rightarrow \Sigma_c^{++}\mu^-(\nu_e\nu_\tau)$	(0010)+(10-1-1)→(20-1-2)+(-1110)+(0-100)+(0001)
then	then	then
$\Sigma_c^{++} \rightarrow \Lambda_c^+\pi^+$	$\Sigma_c^{++} \rightarrow \Lambda_c^+\pi^+$	(20-1-2)→(11-1-2)+(1-100)
then	then	then
$\Lambda_c^+ \rightarrow \Lambda^0\mu^+\nu$	$\Lambda_c^+ \rightarrow \Lambda^0\mu^+\nu_e(\nu_e\nu_\tau)$	(11-1-2)→(000-1)+(1-1-10)+2x(0100)+(000-1)
or	or	or
$\Lambda_c^+ \rightarrow \Lambda^0\pi^+\pi^+\pi^-$	$\Lambda_c^+ \rightarrow \Lambda^0\pi^+\pi^+\pi^-(\nu_e\nu_\mu)(\nu_e\nu_\tau)$	(11-1-2)→(000-1)+2x(1-100)+(-1100)+2x(0100)+(00-10)+(000-1)

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Commonly Stated Reaction	Proposed Reaction Statement	Balanced (qmsc) Description
$\nu_\mu + p^+ \rightarrow \Sigma_c^{++}\mu^-$	$\nu_\mu + p^+ \rightarrow \Delta^{++*}\mu^-$	(0010)+(10-1-1)→(2-1-1-1)+(-1110)
then	then	then
$\Sigma_c^{++} \rightarrow \Lambda_c^+\pi^+$	$\Delta^{++*} \rightarrow \Delta^{+*}\pi^+$	(2-1-1-1)→(10-1-1)+(1-100)
then	then	then
$\Lambda_c^+ \rightarrow \Lambda^0\mu^+\nu$	$\Delta^{+*} \rightarrow \Lambda^0\mu^+\nu_e$	(10-1-1)→(000-1)+(1-1-10)+(0100)
or	or	or
$\Lambda_c^+ \rightarrow \Lambda^0\pi^+\pi^+\pi^-$	$\Delta^{+*} \rightarrow \Lambda^0\pi^+\pi^+\pi^-$ $(\nu_e\nu_\mu)$	(10-1-1)→(000-1)+2x(1-100)+(-1100)+(0100)+(00-10)

Particle	Lepton Excess/Charge				Isospin	Uph-ish-ness	Down-ish-ness	Anti-strange-ness	Charm
	e^+	ν_e	ν_μ	ν_τ					
	q	m	s	c	I_3	U	D	S	C
π^-	-1	1	0	0	-1	-1	1	0	0
K^-	-1	0	1	0	-1/2	-1	0	1	0
K^0	0	-1	1	0	1/2	0	-1	1	0
π^0	0	0	0	0	0	0	0	0	0
η^0	0	0	0	0	0	0	0	0	0
K^0	0	1	-1	0	-1/2	0	1	-1	0
K^+	1	0	-1	0	1/2	1	0	-1	0
π^+	1	-1	0	0	1	1	-1	0	0

Commonly Stated and Proposed Reaction Statement	Balanced (qmsc) Description
$n^0+p^+ \rightarrow p^+p^+\pi^-$	(01-1-1)+(10-1-1)→(10-1-1)+(10-1-1)+(-1100)
$\pi^-+p^+ \rightarrow n^0\pi^0$	(-1100)+(10-1-1)→(01-1-1)+(0000)
$\mu^-+p^+ \rightarrow n^0\nu_\mu$	(-1110)+(10-1-1)→(01-1-1)+(0010)
$K^-+p^+ \rightarrow \Sigma^+\pi^-$	(-1010)+(10-1-1)→(1-10-1)+(-1100)
$K^-+p^+ \rightarrow \Sigma^-\pi^+$	(-1010)+(10-1-1)→(-110-1)+(1-100)
$\pi^-+p^+ \rightarrow \Lambda^0K^0$	(-1100)+(10-1-1)→(000-1)+(01-10)
$p^+ +p^+ \rightarrow \Xi^0p^+K^0K^+$	(10-1-1)+(10-1-1)→(0-11-1)+(10-1-1)+(01-10)+(10-10)
$K^-+p^+\ \Omega^-K^0K^+$	(-1010)+(10-1-1)→(-1-12-1)+(01-10)+(10-10)

Particle	Lepton Excess/Charge				Isospin	Uph-ish-ness	Down-ish-ness	Anti-strange-ness	Charm
	e^+	ν_e	ν_μ	ν_τ					
	q	m	s	c	I_3	U	D	S	C
Σ_{-c}^-	-1	1	-1	0	-1	1	3	0	-1
Σ_{-c}^0	0	0	-1	0	0	2	2	0	-1
Σ_{-c}^+	1	-1	-1	0	1	3	1	0	-1
Ξ_{-c}^-	-1	0	0	0	-1/2	1	2	1	-1
Ξ_{-c}^0	0	-1	0	0	+1/2	2	1	1	-1
Ω_{-c}^-	-1	-1	1	0	0	1	1	2	-1
Ξ_{-2c}^-	-1	0	-1	1	-1/2	2	3	0	-2
Ξ_{-2c}^0	0	-1	-1	1	+1/2	3	2	0	-2
Ω_{-2c}^-	-1	-1	0	1	0	2	2	1	-2
Ω_{-3c}^-	-1	-1	-1	2	0	3	3	0	-3

Particle	Lepton Excess/Charge				Isospin	Uph-ish-ness	Down-ish-ness	Anti-strange-ness	Charm
	e^+	ν_e	ν_μ	ν_τ					
	q	m	s	c	I_3	U	D	S	C
D^0	0	1	0	-1	-1/2	-1	0	0	1
y^0	0	0	1	-1	0	-1	-1	1	1
D^+	1	0	0	-1	+1/2	0	-1	0	1
D^-	-1	0	0	1	-1/2	0	1	0	-1
y^0	0	0	-1	1	0	1	1	-1	-1
D^0	0	-1	0	1	1/2	1	0	0	-1
ϕ,ψ	0	0	0	0	0	0	0	0	0
x^-	-1	1	1	-1	-1	-2	0	1	1
F^+	1	1	-1	-1	0	0	0	-1	1
z^+	1	-1	1	-1	1	0	-2	1	1
z^-	-1	1	-1	1	-1	0	2	-1	-1
F^-	-1	-1	1	1	0	0	0	1	-1
x^+	1	-1	-1	1	1	2	0	-1	-1

<u>Figure 3 - Charmed Mesons - Quarks</u>

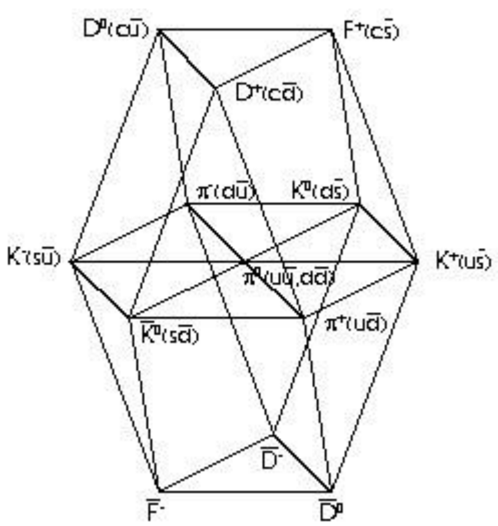

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Figure 4 - Charmed Mesons - Leptons

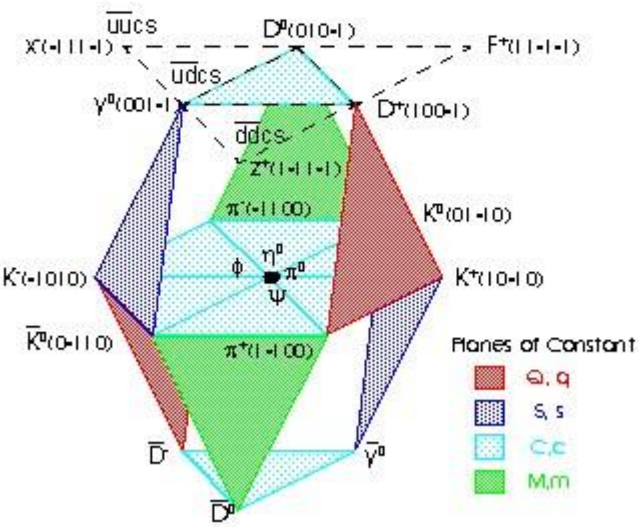
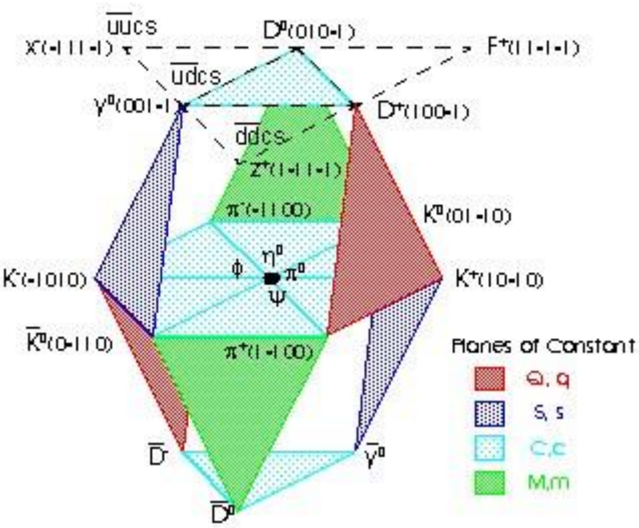


Figure 4 - Charmed Mesons - Leptons



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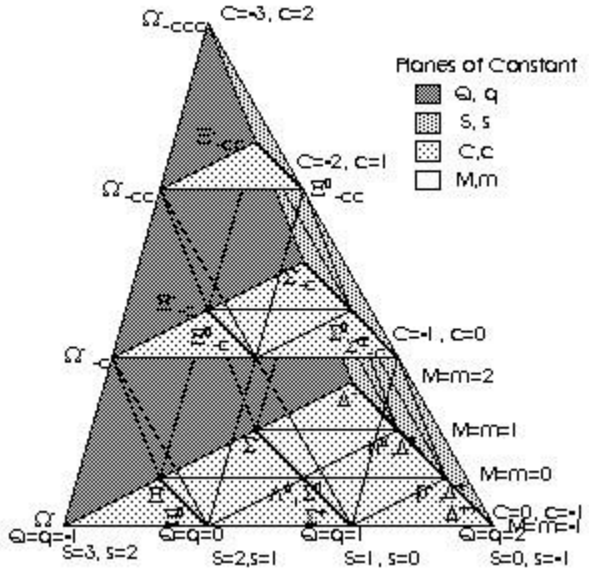

characterizes the basic leptons in terms of the charge excesses they carry. A positron can be simply characterized as (1000), an electron as (-1000), an ν_e as (0100), etc. (Antilepton excesses are expressed as negative lepton excesses.)

Table II describes the complex leptons (μ^- and τ^-) as combinations of two basic lepton excesses and one antilepton excess ((-1110) and (-1101) respectively). The actual bindings (as yet unknown) are characterized by the excesses. The basic

$$\mu^- \rightarrow \nu_\mu \nu_e e^-$$

decay can then be expressed as

$$(-1110) \rightarrow (0010)+(0100)+(-1000).$$

The

$$\tau^- \rightarrow \nu_\tau \nu_\mu \mu^- \text{ and } \tau^- \rightarrow \nu_\tau \nu_e e^-$$

decays can be expressed as

$$(-1101) \rightarrow (0001)+(00\text{-}10)+(-1110)$$

and

$$(-1101) \rightarrow (0001)+(0100)+(-1000),$$

respectively. Note that q, m, s, and c are strictly conserved in all of these decays.

Notice also from Tables I and II that the basic and complex leptons are also assigned values of uphishness, downishness, charm, strangeness and isospin, which are linear combinations of the basic "charges" carried by the respective leptons. See Equations 1, 2, and 3. As a consequence, for example, a free ν_e emitted in a decay process, carries away one unit of charm, one unit of strangeness, -2 units of uphishness, -1 unit of downishness, and -1/2 unit of I_3. In addition, the basic leptons and the μ^-, and τ^-- look like particles with a baryon number of -1.

Table III characterizes the familiar uncharmed meson octet in terms of the lepton-antilepton excesses of the bindings of those particles. These characterizations reproduce the strangeness and isospin commonly assigned to them. From the characterizations in Table III, the

$$\pi^- \rightarrow \mu^- \nu_\mu$$

decay can be expressed simply as

$$(-1100) \rightarrow (-1110)+(00\text{-}10).$$

The

$$\tau^- \rightarrow \pi^- \nu_\tau$$

decay can be expressed simply as

$$(-1101) \rightarrow (-1100)+(0001).$$

These decays and the masses of the particles suggest that the π^- is slightly more complex than the μ^-. The former might be a binding of as few as four basic leptons, including a $\nu_\mu \bullet \nu_\mu$ pair. The latter might be a simple $\nu_\mu \bullet \nu_e \bullet e^-$ binding. The decays and the particle masses suggest that τ^- might be a binding of as few as five basic leptons but probably more, including several lepton-antilepton pairs and one excess ν_τ, that accounts for most of its mass.

The masses of the K family of mesons suggest that they may each contain about as many basic leptons as three pions, possibly 10 to 14. Characterizing the K^- and K^0 by their excesses as (-1010) and (0-110), respectively, produces their familiar properties. Table IV shows a few of the familiar meson decays, restated both in terms of the (qmsc) conservation and of the proposed complete reaction. Notice that the proposed reactions differ from the commonly stated reaction in that they all include an undetected ($\nu_e\nu_\mu$) pair. This pair carries away 1 unit of S and leaves behind 1 unit of D.

The resulting symmetries among uncharmed mesons are presented in the familiar hexagonal octet representation in Figure 1. All of the particles in the plane have a c-charge of zero. Particles and their respective antiparticles are at opposite vertices of the hexagon. Horizontal lines between particles are lines of constant s-charge and strangeness. Vertical lines are lines of constant I_3. Sinister lines are lines of constant q-charge. Dexter lines are lines of constant metacharge. Note that in the (qmsc) notation, an antiparticle has the negative charge excesses of the corresponding particle. Any truly neutral particle such as an η^0, for which (qmsc) = (0000), could occupy the center of the hexagon along with the π^0. For each of these mesons, the excesses of the charges are such that no single absolute excess exceeds 1 and the aggregate excess across all charges types is zero.

Table V describes the familiar particles comprising the spin 1/2 octet and spin 3/2 decuplet of uncharmed baryons in terms of the proposed lepton-antilepton excesses of their bindings. These characterizations reproduce the uphishness, downishness, strangeness and isospin commonly assigned to them. Comparing the masses of even the lightest of these particles, the proton and neutron, to the masses of the kaons and pions suggests that these bindings could easily contain more than twenty basic leptons and antileptons, differing by about 2 to 6 leptons per series. Each particle probably contains a core of tightly bound leptons and antileptons in several closed shells with no net charge, culminating in an outer shell comprised of the unpaired leptons and antileptons that result in the particle's (qmsc) characterization. Figure 2 (with the octet and decuplet overlaid) shows the (qmsc) symmetries among the particles. Note that all have a c-charge excess of -1. The excesses of the other charges sum to zero. For the particles that comprise the octet, except for c-charge, these excesses look exactly like those of the uncharmed meson octet. Particles with individual absolute charge excesses greater than 1 are not precluded by the lepton model, but they would be expected to be less stable. The particles at the vertices of the decuplet: the Δ^-, Δ^{++}, and Ω^-, are proposed to have respective metacharge, q-charge, and s-charge excesses of 2.

Table VI describes some of the commonly observed uncharmed baryon decays restated both in terms of the (qmsc) conservation and of the proposed complete reaction. Note, the Σ^0 and Λ^0 occupy the same position in the diagram (Figure 2) and have the same (qmsc) representation. Except for the

$$\Sigma^0 \rightarrow \Lambda^0\gamma$$

decay, all of those presented in Table VI are weak. The proposed complete reaction for the simple

$$n^0 \rightarrow p^+e^-\nu_e$$

beta decay, with one lepton and one antilepton, is the same as the commonly stated reaction. For all of the rest, the proposed complete reaction includes the same undetected ($\nu_e\nu_\mu$) pair proposed in weak meson decays. Table VII describes some of the commonly observed uncharmed baryon collisions, restated in terms of the (qmsc) conservation. All are strong, so that the commonly stated reaction and the proposed complete reaction are the same.

Things get a little mirky when it comes to charmed particles. The standard model provides for a triad of charmed mesons: the D^0(cu), D^+(cd), and the F^+(cs) and their respective antiparticles. Figure 3 is the familiar three dimensional diagram depicting each of the triads as a parallel plane above and below the plane containing the uncharmed meson octet. With the lepton model, it is easy to characterize mesons that map directly onto the D^0 and the D^+ as (010-1) and (100-1). The characterizations reproduce the isospin (-1/2,1/2), charm(1) and strangeness(0) commonly assigned to these particles. See Table VIII. These (qmsc) representations are satisfying in that they each contain one lepton excess and one deficiency, just like all of the other non-neutral mesons characterized so far. To account for the commonly assigned isospin(0), charm(1) and strangeness(1) of the F^+, however, requires a (qmsc) characterization of (11-1-1). Although this characterization is not precluded by the lepton model, it does contain two lepton excesses and two deficiencies. In this respect, it is a little unusual. The lepton model does include a charmed triad consisting of the D^0, D^+, and a particle characterized by (001-1), labeled in Table VIII by y^0. The y^0 would be both charmed and antistrange. The standard model, in which mesons are only allowed to contain a quark and an antiquark, does not provide for mesons which are both charmed and antistrange. The y^o could, however, represent the ι or θ particle, which are electrically neutral mesons that are known not to neatly fit the standard model.

Figure 4 is a three dimensional diagram depicting the triad suggested by the lepton model and the triad of antiparticles as parallel planes above and below the plane containing the uncharmed meson octet. The four hexagonal slices through the center of the resulting solid are planes of zero q-charge, metacharge, c-charge (charm) or s-charge (strangeness). The eight triangular faces of the solid are planes of non-zero q-charge, metacharge, c-charge or s-charge. In addition, once the above characterizations of the F^+ and y^o are made, two more equally acceptable charmed, antistrange characterizations (1-11-1) and (-111-1), can be made. They are labeled by z^+ and x^-, respectively inTable VIII. Although the particles characterized as x^-, y^o, and z^+ do not map onto the standard quark-antiquark model of mesons, they would map onto the two quark - two anti quark systems uusc, udsc, and ddsc, respectively. See Equation 3. The whole sextet of charmed meson characterizations is shown in the top plane of Figure 4. It should be remembered that in the lepton model, a single characterization may represent any number of particles that have different numbers of paired leptons and antileptons but the same excesses. They would necessarily occupy the same position on the diagram. For example, any number of truly neutral particles such as the ψ, ϕ, π^o, η^o, etc. might occupy the center. The familiar strong ψ and ϕ decays should, at this point, be so easy to express in the lepton model that they are left as exercises to the reader.

Table IX shows some of the more familiar decays of charmed mesons, expressed both in terms of the (qmsc) conservation and of the proposed complete reaction. Note that the

$$D^o \rightarrow K^-\pi^+$$

decay results in a loss of both a unit of charm and a unit of strangeness. In this respect it is doubly weak. Restated in terms of (qmsc) conservation this the decay becomes

$$D^o \rightarrow K^-\pi^+(\nu_e\nu_\tau)(\nu_e\nu_\mu)$$

It is possible (but not likely without an additional light neutral particle in the decay products) that there is actually a double decay with an intermediate particle, slightly less massive than the D^o and characterized as a y^o, as shown in Table IX. The

$$D^o \rightarrow K^o\pi^+\pi^+\pi^-\pi^-$$

results in a gain of charm and a loss of strangeness. Restated In terms of (qmsc) conservation this the decay simply becomes a weak

$$D^o \rightarrow K^o\pi^+\pi^+\pi^-\pi^-(\nu_\mu\nu_\tau)$$

If the θ particle, one of those that has been difficult to categorize in the standard model, is a binding characterized as a y^o, the decay of charmonium:

$$\psi \rightarrow \theta\ \gamma$$

simply falls into place as a weak $\psi \rightarrow \theta\ \gamma\ (\nu_e\nu_\tau)$.

What is really interesting is that if the beautiful B^- is simply characterized as an x^- binding and if the B^o is simply characterized as an y^o, the respecive familiar decays of those particles:

$$B^- \rightarrow D^o\pi^- \text{ and } B^o \rightarrow D^o\pi^+\pi^-$$

can be expressed as simple weak decays

$$B^- \rightarrow D^o\pi^-(\nu_e\nu_\mu) \text{ and } B^o \rightarrow D^o\pi^+\pi^-(\nu_e\nu_\mu)$$

respectively. This suggests that beauty might not result from a bottom quark but from what actually looks like a (csu) quark combination, which when combined with a d or u, yields a B^o or a B^-, respectively. Where then is truth? It might look like a (csd) quark combination that is part of a heavy binding characterized by the z^+.

For completeness and in a fully consistent manner, a set of negatively charmed baryons is suggested by the model. That set is characterized and labeled in Table X . Figure 5 is a three dimensional diagram depicting the resulting sextet, triad, and singlet of charmed baryons in successive parallel planes of increasing c-charge (decreasing charm) above the plane containing the uncharmed baryon decuplet. These all have a negative value of charm and do not map directly onto charmed baryons suggested by the standard model. They would, however, map onto various quark-antiquark systems each with a net quark excess of three quarks. It is not certain if any of these particles have been observed. It is possible that some might be produced by collisions between particles like a ν_τ and a proton. A set of charmed mesons that maps onto the standard model is presented in Table XI . Note that the Σ_c^{++} and Λ_c^+ would be characterized by (20-1-2) and (11-1-2), respectively. The diagram for the complete set would

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look like an inverted tetrahedron.

It is not certain that charm is actually necessary to describe some commonly observed baryon reactions that charm is commonly used to describe. For example, a typical reaction between a ν_μ and a proton is shown in Table XII. A commonly accepted assessment of the reaction in the standard model is that an intermediate Σ_c^{++} and a μ^- are produced. The Σ_c^{++} is then thought to decay into a Λ_c^+ and a p^+. The Λ_c^+ is then thought to decay into a Λ^0 and either three pions or a μ^+ and a ν. To make this reaction work in the standard model, flavor changing neutral currents that convert downness into charm and charm into antistrangeness are needed. Even in the lepton model, the collision and decays are weak or even doubly weak. If the intermediate particles are not in fact the charmed Σ_c^{++} and Λ_c^+, but are simply characterized in the same manner as the Δ^{++} and Δ^+, but with more massive bindings, the reactions all fall neatly into place in the lepton model as a strong collision and as one strong and one weak decay. See Table XIII for expression of the proposed reactions in terms of conservation of lepton excesses.

Many exotic particles can be imagined within the context of the Lepton model. These may not generally map neatly onto the standard model. However, keeping in mind that in the lepton model, quarks are not really particles, with a few simple extensions the standard model could accommodate them. The inverse of Equation 3 is Equation 4. Combining this with Equation 2 yields Equation 5. As a result, any particle that can be described as a combination of the u, d, s and c quarks, such that the difference between its number of quarks and antiquarks is an integral multiple of three, would have an integral baryon number and would be a binding of an integral number of leptons characterized by its excesses by Equation 6. This is exactly the case for the set of negatively charmed baryons described in Table X and for the leptons themselves. See Tables I and II

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Particle	Lepton Excess/Charge				Isospin	Uph-ish-ness	Down-ish-ness	Anti-strange-ness	Charm
	e^+	ν_e	ν_μ	ν_τ					
	q	m	s	c	I_3	U	D	S	C
π^-	-1	1	0	0	-1	-1	1	0	0
K^-	-1	0	1	0	-1/2	-1	0	1	0
K^0	0	-1	1	0	1/2	0	-1	1	0
π^0	0	0	0	0	0	0	0	0	0
η^0	0	0	0	0	0	0	0	0	0
K^0	0	1	-1	0	-1/2	0	1	-1	0
K^+	1	0	-1	0	1/2	1	0	-1	0
π^+	1	-1	0	0	1	1	-1	0	0

Particle	Lepton Excess/Charge				Isospin	Uph-ish-ness	Down-ish-ness	Anti-strange-ness	Charm
	e^+	ν_e	ν_μ	ν_τ					
	q	m	s	c	I_3	U	D	S	C
D^0	0	1	0	-1	-1/2	-1	0	0	1
y^0	0	0	1	-1	0	-1	-1	1	1
D^+	1	0	0	-1	+1/2	0	-1	0	1
D^-	-1	0	0	1	-1/2	0	1	0	-1
y^0	0	0	-1	1	0	1	1	-1	-1
D^0	0	-1	0	1	1/2	1	0	0	-1
ϕ,ψ	0	0	0	0	0	0	0	0	0
x^-	-1	1	1	-1	-1	-2	0	1	1
F^+	1	1	-1	-1	0	0	0	-1	1
z^+	1	-1	1	-1	1	0	-2	1	1
z^-	-1	1	-1	1	-1	0	2	-1	-1
F^-	-1	-1	1	1	0	0	0	1	-1
x^+	1	-1	-1	1	1	2	0	-1	-1

Particle	Lepton Excess/Charge				Isospin	Uph-ish-ness	Down-ish-ness	Anti-strange -ness	Charm
	e^+	ν_e	ν_μ	ν_τ					
	q	m	s	c	I_3	U	D	S	C
π^-	-1	1	0	0	-1	-1	1	0	0
K^-	-1	0	1	0	-1/2	-1	0	1	0
K^0	0	-1	1	0	1/2	0	-1	1	0
π^0	0	0	0	0	0	0	0	0	0
η^0	0	0	0	0	0	0	0	0	0
K^0	0	1	-1	0	-1/2	0	1	-1	0
K^+	1	0	-1	0	1/2	1	0	-1	0
π^+	1	-1	0	0	1	1	-1	0	0

Commonly Stated Reaction	Proposed Reaction Statement	Balanced (qmsc) Description
$D^0 \to K^-\pi^+$	$D^0 \to K^-\pi^+(\nu_e\nu_\mu)(\nu_e\nu_\tau)$	(010-1) →(-1010)+(1-100)+2x(0100)+(00-10)+(000-1)
	or	or
	$D^0 \to y^0(\nu_e\nu_\mu)$	(010-1) →(001-1)+(0100)+(00-10)
	then	then
	$y^0 \to K^-\pi^+(\nu_e\nu_\tau)$	(001-1) →(-1010)+(1-100)+(0100)+(000-1)
$D^0 \to K^0\pi^+\pi^+\pi^-\pi^-$	$D^0 \to K^0\pi^+\pi^+\pi^-\pi^-(\nu_\mu\nu_\tau)$	(0-101) →(0-110)+2x(1-100)+2x(-1100)+(00-10)+(0001)
$\varphi \to \phi\,\gamma$	$\varphi \to \phi\,\gamma\,(\nu_e\nu_\tau)$	(0000) →(010-1)+(0-100)+(0001)
$B^- \to D^0\pi^-$	$B^- \to D^0\pi^-(\nu_e\nu_\mu)$	(-111-1) →(010-1)+(-1100)+(0-100)+(0010)
$B^0 \to D^0\pi^+\pi^-$	$B^0 \to D^0\pi^+\pi^-(\nu_e\nu_\mu)$	(00-11)(0-101) →(1-100)+(-1100)+(0100)+(00-10)

$$\begin{bmatrix} q \\ m \\ s \\ c \end{bmatrix} = \begin{bmatrix} 2 & 0 & -1 & -1 \\ 2 & -1 & 0 & -1 \\ -1 & 0 & 0 & 1 \\ -4 & 1 & 1 & 1 \end{bmatrix} \times \begin{bmatrix} A \\ U \\ D \\ S \end{bmatrix} \qquad \begin{bmatrix} U \\ D \\ S \\ C \end{bmatrix} = \begin{bmatrix} -1 & -2 & -2 & -1 \\ -2 & -1 & -2 & -1 \\ -1 & -1 & 0 & -1 \\ 1 & 1 & 1 & 0 \end{bmatrix} \times \begin{bmatrix} q \\ m \\ s \\ c \end{bmatrix}$$