$\Xi^- \rightarrow \Lambda + \pi^-$

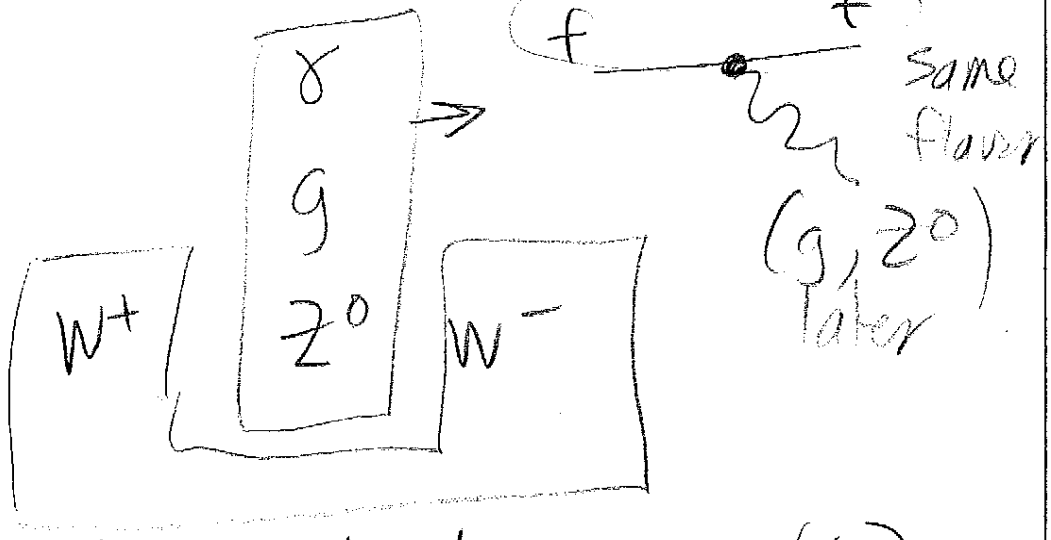
Q	-1	0	-1	OK
B	(dss)	(uds)		OK.
	$+1$	$+1$	0	

A $s \rightarrow u$ happened!

$-\frac{1}{3}$ $+\frac{2}{3}$ → Weak interaction!
→ NO NEUTRINOS

u	c	t
d	s	b
e	ν	τ
ν_1	ν_2	ν_3

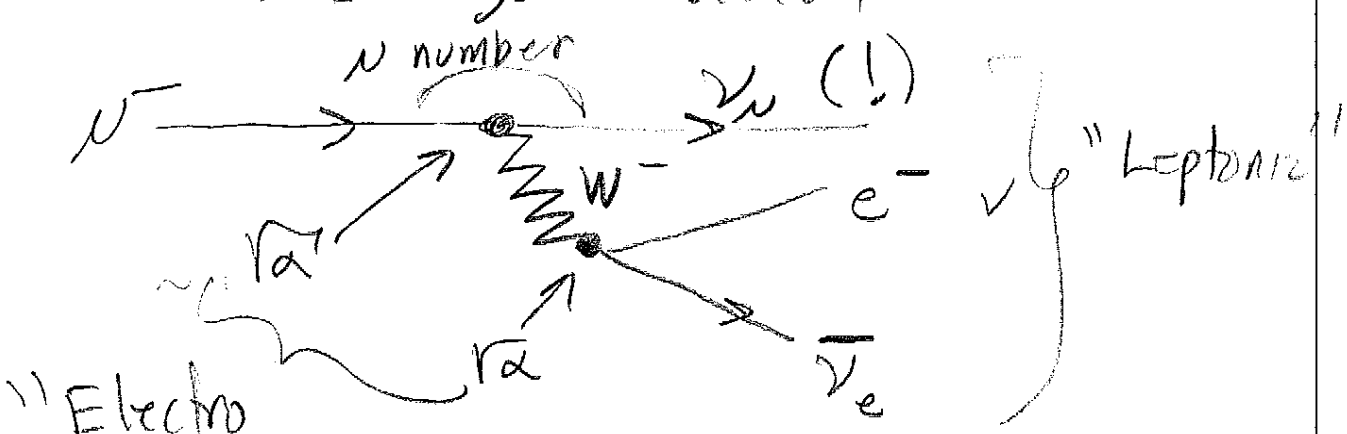
← peculiar choice.



make vertical muons (#1)

(#2) W always talks to a distinct linear superposition of the "muss" eigenstates.

"CLASSIC" ν^- decay.



$$|\nu_\mu\rangle = \sum_i U^*_{\mu i} |\nu_i\rangle$$

flavor eigenstate.

"muss" eigenstate

see p. 181 of the little book

$$|\nu_e\rangle = \sum_i U_{ei} |\nu_i\rangle$$

↑ called the MNS Matrix

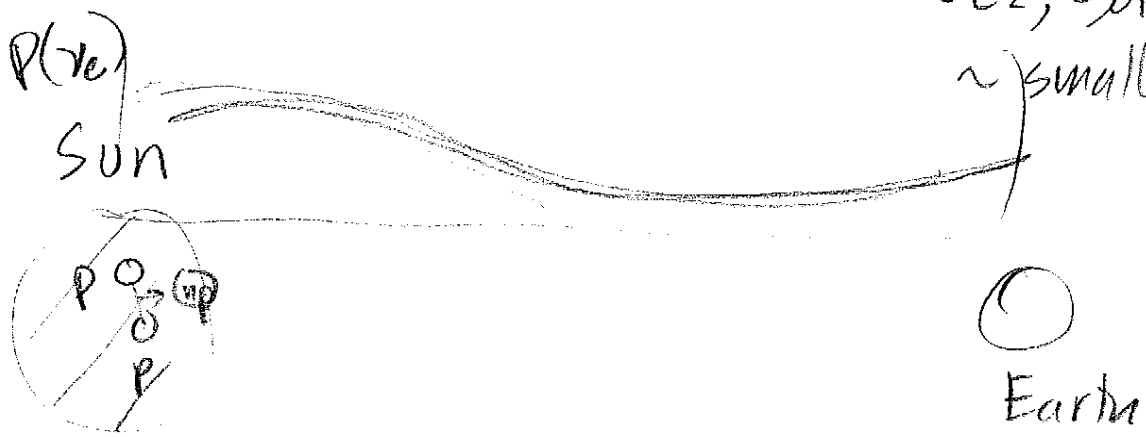
$u\bar{u} \to d\bar{d}$ Similar...

One Thing: $\bar{\nu} \to \nu_2 e^- \bar{\nu}_1 \propto |U_{\mu 2} U_{e1}|^2$

Why: $\langle \nu_2 | \nu_\mu \rangle \propto U_{\mu 2}$ (biggest)

$\langle \bar{\nu}_2 | \bar{\nu}_e \rangle \propto U_{e1}$ (biggest)

$U_{e2}, U_{\mu 1}$ ~ smaller!



$pp \to npe^+\nu_e$

Fusion

Planetary Quantum Mechanics!

Semihadronic/leptonic Weak Interactions

(#1) $m_{\nu_{1,2,3}} \ll m_e, m_\mu, m_\tau$

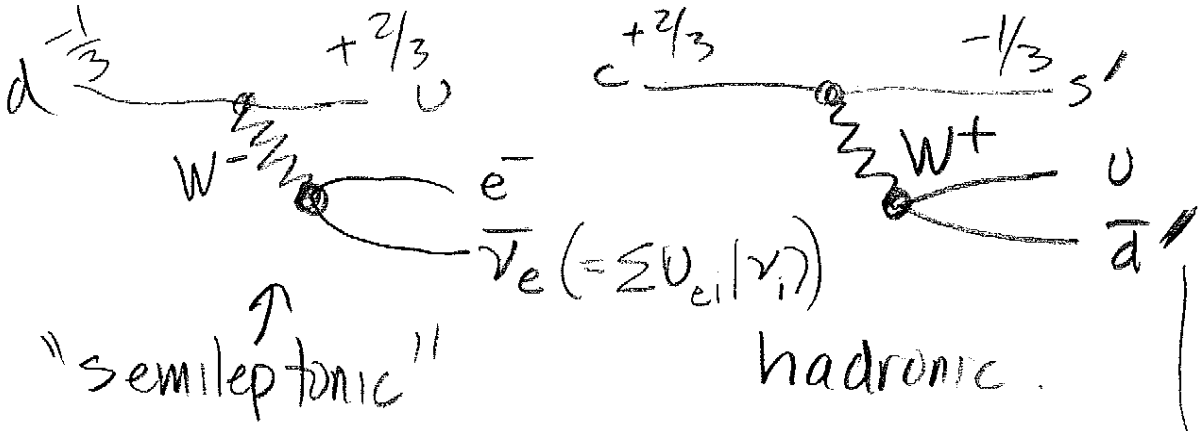
W's always go from charged to neutral.

Quarks $m_s > m_u$!. !. $m_b >> m_u$!

$m_d > m_u$

↑ u 3 ↓ c 1200

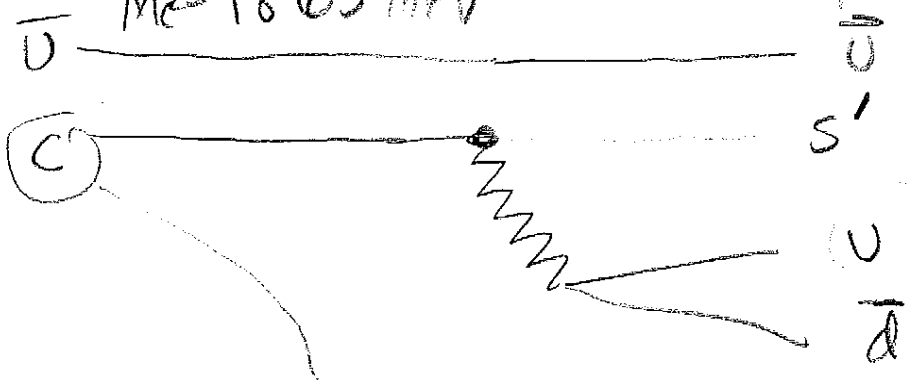
d 7 s 120



↓ W+ Once again does not "couple" to the "mass" eigenstates. Way bigger deal here, no.

D^0 meson decay → Energy Momentum

Mc² 1865 MeV



$m_b c^2 > m_{D^0} c^2$

$$|s'\rangle = V_{cd}|d\rangle + V_{cs}|s\rangle + V_{cb}|b\rangle$$

$$|\bar{d}'\rangle = V_{ud}^*|\bar{d}\rangle + V_{us}^*|\bar{s}\rangle + V_{ub}^*|\bar{b}\rangle$$

$\begin{pmatrix} \bar{u} \\ s' \end{pmatrix} \rightarrow \begin{pmatrix} \bar{u} \\ d \end{pmatrix}$ amp V_{cd} π^- (excited)

$\begin{pmatrix} \bar{u} \\ s \end{pmatrix}$ amp V_{cs} K^- (or excited)

$\begin{pmatrix} u \\ \bar{d}' \end{pmatrix} \rightarrow \begin{pmatrix} u \\ \bar{d} \end{pmatrix}$ amp V_{ud}^* π^+

$\begin{pmatrix} u \\ s \end{pmatrix}$ amp V_{us}^* K^+

$|V_{cs}| \simeq |V_{ud}| \simeq 0.975$ (plug)

$|V_{cd}| \simeq |V_{us}| \simeq 0.226 \simeq$ "$\sin\theta_c$"

$\sqrt{1-\sin^2\theta_c}$

"Cabibbo Allowed."

$D^0 \rightarrow K^-\pi^+$ Rate $\propto (0.975)^2$

"C suppressed"

$D^0 \rightarrow \pi^-\pi^+$
K^+K^-

} Rate $\propto (0.226 \cdot 0.975)^2$
$\sim .04 \times (K^-\pi^+)$

"DC$_0$ suppressed"

$D^0 \rightarrow K^+\pi^-$ $\sim (.04)^2$] Use for PhD's