

(1) WARM UP

$L = \begin{pmatrix} \nu_L \\ e_L \end{pmatrix}$	$\frac{I^3}{1/2}$	$\frac{Y}{-1/2}$	$\frac{Q = T^3 + Y}{0}$
$\bar{E} = e_R^+$	0	1	$+1$
$\langle H \rangle = \begin{pmatrix} 0 \\ \frac{v}{\sqrt{2}} \end{pmatrix}$	0	$1/2$	$1/2$
	$-1/2$	$1/2$	0

$$\langle H \rangle^+ L \bar{E} \rightarrow \frac{v}{\sqrt{2}} \bar{e}_L e_R^+ \rightarrow \text{mixes } e_L \text{ fer into massive electron}$$

So:

$\nu_L^x \longrightarrow$	LH NEUTRINO (2 dof)
$e = (e_L^x, e_R^x)$	electron (4 dof)
$\uparrow \quad \quad \uparrow$ LH (2 dof) RH (2 dof)	

(2) ADD A NEW PARTICLE, RH (anti) NEUTRINO:

$N = \nu_R^+$	$\frac{I^3}{0}$	$\frac{Y}{Y_N}$	$\frac{Q}{Y_N}$
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$$\boxed{H^a \epsilon_{ab} L^b N + h.c.}$$

supercontracted

HYPERCHARGE: $Y_H + Y_L + Y_N = 0$

$$\frac{1}{2} - \frac{1}{2} + Y_N = 0 \Rightarrow \boxed{Y_N = 0}$$