

# Nucleons:

(*NAIVELY* applying ideal gas law:  $p = Nk_B T/V$  to quarks  $\Rightarrow N = 3$ )

up quark	$2.3 \text{ MeV}/c^2 = 4.10 \times 10^{-30} \text{ kg}$	$\lambda_C = 539 \text{ fm}$
down quark	$4.8 \text{ MeV}/c^2 = 8.56 \times 10^{-30} \text{ kg}$	$\lambda_C = 258 \text{ fm}$

## Proton:

net quarks $mc^2$	9.4 MeV	2 up + 1 down
$\Delta E$	929 MeV	nucleon mass - net quarks mass
$T = (\Delta E/N) \cdot 2/3k_B$	$2.40 \times 10^{12} \text{ K}$	cf. Hagedorn temperature
thermal pressure?	$3.98 \times 10^{34} \text{ Pa}$	volume with charge radius
<b>thermal pressure?</b>	<b><math>8.21 \times 10^{34} \text{ Pa}</math></b>	<b>using Compton volume</b>

## Neutron:

net quarks $mc^2$	11.9 MeV	1 up + 2 down
$\Delta E$	928 MeV	nucleon mass - net quarks mass
$T = (\Delta E/N) \cdot 2/3k_B$	$2.39 \times 10^{12} \text{ K}$	cf. Hagedorn temperature
thermal pressure?	$4.62 \times 10^{34} \text{ Pa}$	volume with known radius
<b>thermal pressure?</b>	<b><math>8.24 \times 10^{34} \text{ Pa}</math></b>	<b>using Compton volume</b>

# Quark-gluon plasma

I do not see it as a stable or persistent state of large bodies.

Unstable "outside" hadrons.