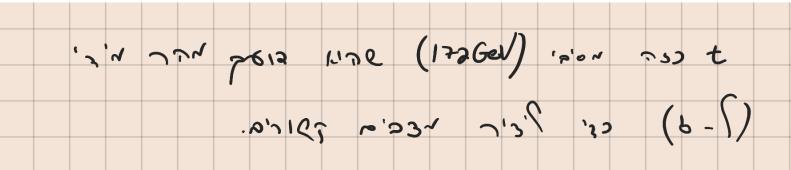
Question 1

Many times during this course you'll be asked to analyze a process involving particles you're not yet familiar with. To learn about the properties of particles you can resort to the **Particle Data Group** (PDG) web page: http://pdglive.lbl.gov/Viewer.action.

- 1. To familiarize yourselves with the PDG webpage, click the link above and look write down the mass, EM charge, and quark content for the
 - (a) $\pi^0 = (\sqrt{3} 4\lambda)/\sqrt{3} = \sqrt{3} 4\lambda = 0$, 135 MeV (b) $K^- = \sqrt{3} = -\frac{2}{3} \frac{1}{3} = -1$, $\sqrt{3} = \sqrt{3}$ (c) $B^+ = \sqrt{6} = \frac{2}{3} (-\frac{1}{3}) = 2$, 5 = 8 GeV

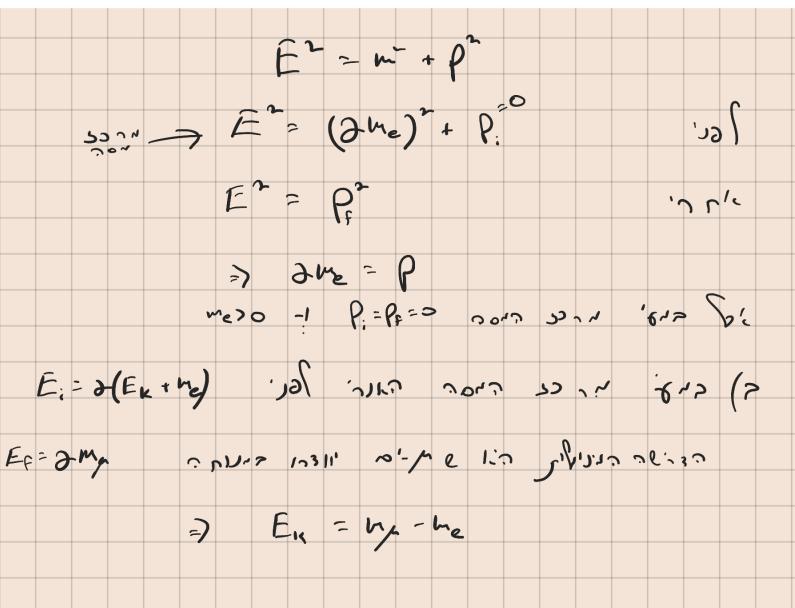
 - (d) Ω^{-} = 555=-3·>=) 1 , 1.612GeV (e) Λ^{0} = Ω^{-} = $\Omega^$

 - (f) \(\Sigma^0 = 4 d > -) + \frac{1}{3} \frac{1}{3} \frac{1}{3} = 0, 1.102 \text{GeV}
- 2. (Optional) In the PDG there are no hadrons containing a top quark. Explain why this is the case (i.e. why does the top quark not form any bound states)?



Question 2

- 1. The process $e^+e^- \to \gamma$ is forbidden in the SM. Show explicitly that this process can not conserve both the energy and momentum simultaneously.
- 2. Determine what is the minimal kinetic energy (in the center of mass frame) required for an electron in order for the process $e^+e^- \to \mu^+\mu^$ to occur.



Question 3

Determine whether the following processes are allowed in the SM. If the process is forbidden, list which conservation laws are violated.

- 1. $\Sigma^0 \to \Lambda^0 \pi^0$
- 2. $K^- \to \pi^- \pi^+ \pi^-$
- 3. $\tau^- \rightarrow \nu_\tau \mu^-$
- 4. $p \rightarrow e^+ \gamma$
- 5. $pp \to ppp\bar{p}$
- 6. $pe^- \rightarrow \nu_e \pi^0$
- 7. $n\bar{n} \to \pi^{+}\pi^{-}\pi^{0}$
- 8. $\pi^+ n \to \pi^- p$

7) 70= 4 1/uh N=41/ N=41/ N=41/

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