

# Physics 100 - Spring 2007 - Recitation 10

①

$U \equiv$  up quark, charge =  $+\frac{2}{3}$

$d \equiv$  down quark, charge =  $-\frac{1}{3}$

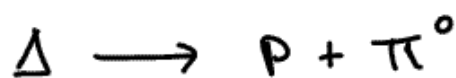
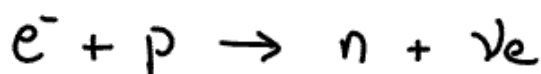
$S \equiv$  STRANGE quark, charge =  $-\frac{1}{3}$

Suppose only 3 quarks ( $u, d, s$ ) existed.

How many baryons with what charges can you make from these quarks?

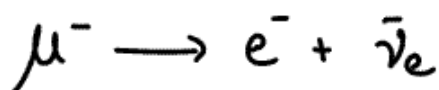
How many mesons with what charges can you make from these quarks?

② Identify the fundamental force of nature responsible for the following particle interactions -



↑

Sort of an excited STATE of a proton called the "Delta"



③

(See p. 411 in Hobson)

In the United States the annual energy consumption is approximately  $10^{18}$  Joules.

Suppose you were able to find a source of antimatter and perfected the design of a matter-antimatter power reactor (a la Star Trek warp engines) . . . .  
What mass of matter/antimatter would it take to supply the energy needs of the United States for 1 year?

④

Can you think of a way in which we might be able to determine experimentally whether or not the sun is fusing silicon in its core ???

⑤

Suppose you were immortal. . . with no breaks. . . no need to sleep or eat —

how long would it take you to run a distance of one light year?

⑥ What is the Higgs particle ... or should I say, what role does it play in modern physics?

What does it mean that scientists are "searching for the Higgs"?

Why is it important to you that we understand what it is that does what the Higgs does?

⑦ Review the basic idea of the doppler shift —

How is it that astronomers can determine the amount of "redshift" or "blueshift" in the light from a distant object in order to determine the relative velocity of that object w/ respect to earth?