EXAM
Subatomic Physics 2

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`Course lectured by Dirk Ryckbosch, it is written on scrap paper during the exam.`

1 Pion parity (3pt)

Nothing out of the ordinary.

2 PMNS matrix (6pt)

What is given:

- PMNS matrix in $_{\alpha i}$ parametrisation and with $s_{ij}, c_{ij}, \delta_{PC}$.
- characteristics of experiments are given:
  - Name of exp: Solar, Atmosphere, reactor, accelerator
  - Distance L
  - E_ν
  - $\left|\Delta m^2\right|$

2.1 A

Discuss for at least 2 matrix elements which kind of experiment you would choose to determine its value. Discuss how you would get from the observed values to the matrix element.

2.2 B

Discuss how the sign of the mass difference was obtained Δm^2_{12}.

2.3 C

Given a figure w/ the leptonic unitary triangle. Discuss how the triangle is related to the matrix (and its elements). What is necessary for the imaginary part of z to be non-zero? And what kind of experiment do you need for this to be determined?

3 PDF (3pt)

Given formula $F_2(x) = x\Sigma z^2(q(x) + \bar{q}(x))$, discuss what each pm in the formula means. Use this formula and the principle of isospin invariance to derive an expression for the Gottfried sumrule. (the definition is given).
The experimental value is given, is it consistent with your expected value, why (not?