1 Homework 1

1.1 Question 5

$Q = M(^{223}_{88}\text{Ra}) - (M(^{14}_{6}\text{C} + M(^{209}_{82}\text{Pb}))) = 31.828\text{MeV}$

2 Project

2.1 Part 1a

Will type this later!

2.2 Part 1b

$$H = H_0 + H_1 = \begin{bmatrix} 0 & 0 \\ 0 & 2 \end{bmatrix} + \begin{bmatrix} -g & -g \\ -g & -g \end{bmatrix} = \begin{bmatrix} -g & -g \\ -g & 2-g \end{bmatrix}$$

Eigenvalues: $1 - g \pm \sqrt{g^2 + 1}$

2.3 Part 1c: Hamiltonian Matrix

No broken pairs, $S = 0$, four lowest single particle levels filled by four particles.

$$H = H_0 + H_1 = \sum_{p\sigma}(p-1)a_{p\sigma}^{\dagger}a_{p\sigma} - g\sum_{pq}P_p^+ P_q^-$$

$$H_0 = \begin{bmatrix} 2 & 0 & 0 & 0 & 0 & 0 \\ 0 & 4 & 0 & 0 & 0 & 0 \\ 0 & 0 & 6 & 0 & 0 & 0 \\ 0 & 0 & 0 & 6 & 0 & 0 \\ 0 & 0 & 0 & 0 & 8 & 0 \\ 0 & 0 & 0 & 0 & 0 & 10 \end{bmatrix}$$

$$H_1 = \begin{bmatrix} -2g & -g & -g & -g & -g & 0 \\ -g & -2g & -g & -g & 0 & -g \\ -g & -g & -2g & 0 & -g & -g \\ -g & -g & 0 & -2g & -g & -g \\ -g & 0 & -g & -g & -2g & -g \\ 0 & -g & -g & -g & -g & -2g \end{bmatrix}$$

$$H = H_0 + H_1 = \begin{bmatrix} 2-2g & -g & -g & -g & -g & 0 \\ -g & 4-2g & -g & -g & 0 & -g \\ -g & -g & 6-2g & 0 & -g & -g \\ -g & -g & 0 & 6-2g & -g & -g \\ -g & 0 & -g & -g & 8-2g & -g \\ 0 & -g & -g & -g & -g & 10-2g \end{bmatrix}$$

3 Alex's email assignment from 7/7

Here's the interaction that goes with Gustav's talk today.

cceisdpn.int

You should use it with the sdpn.sp model space.

Before we meet at 2:30 your group should use this for our example of na23 and comment on

1) energy levels compared to exp

2) the extent to which isospin is conserved

I put all this in the fridayex folder in rsh