**PHYS 232 Assignment # 1 Due Wednesday 19/2/2020 Name:**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1a | 1b | 1c | 1d | 1e | 1f | 2 | 3a | 3b | ترتيب | Total |
| 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 100 |
|  |  |  |  |  |  |  |  |  |  |  |

1. **Attach (or draw) this table on the front of your solution sheets**
2. **Use the masses in eV/c2 and momenta in eV/c. Do not use kg and m/s.**
3. **Give answers to the correct number of significant figures.**
4. 1. A 56Mn nucleus (mass =55.92519 u) at rest decays to 56Fe + e + ν. The 56Fe nucleus has a mass of 55.92067 u. The electron is emitted in the positive x-direction with a kinetic energy of 1.00 MeV and the neutrino is emitted in the positive y-direction
5. Show that the total kinetic energy of the products in this case is 3.70 MeV**.**

**(10%)**

1. What is the maximum possible energy of the neutrino? **(10%)**
2. Explain why the electron must be treated relativistically while the 56Fe nucleus can be treated non-relativistically. **(10%)**
3. Use conservation of momentum to show that the recoil energy of the 56Fe nucleus can be safely neglected as a first approximation no matter what the energy of the neutrino is. **(10%)**
4. What is the speed (in units of c) and momentum (in MeV/c) of the electron in this case? **(10%)**
5. What is the recoil momentum $\vec{P} $ (in MeV/c) and kinetic energy (in eV) of the 56Fe nucleus in this case? Write $\vec{P} $ using $\hat{i}, \hat{j}$ notation.

**(10%)**

2. What is the percentage of error when you use the classical (non-relativistic) formula for the kinetic energy of a particle travelling with a speed = 0.6 c ?

 **(10%)**

3. A neutral pion (mass = 135 MeV/c2) moving in the positive x-direction with a velocity of 0.800c decays into two photons of unequal energies.

* 1. What is the energy (in MeV) momentum (in MeV/c) of the pion? **(10%)**
	2. If one photon is detected at an angle of 20.0° with the x-axis, at what angle is the second photon detected? **(10%)**

**+10%** for good hand-writing and clear and well-organized solutions.

**You are expected to work alone. Academic honesty is very important. Cheating will make you lose grades.**