**Tutorial Sheet: 02 (Nuclear Physics)**

1. Explain the Liquid Drop Model and compare with Shell model.
2. For the following nuclear reaction

92U238 90Th234 + 2He4

Calculate

1. The total energy released in the reaction.
2. The K.E. of Alpha (α) particle, assume the nucleus being at rest initially.

Given that mass of U238 =238.12492 u.

Th234 =234.11650u.

He4 = 4.00387 u.

1. Define binding energy of a nucleus. Sketch the B.E. per nucleon verses mass no. curve and mention the important findings of the curve.
2. Define Q value of a nuclear reaction. Explain its physical significance. For the d-t fusion reaction, calculate the Q value of the reaction

1H2 + 1H3 2He4 + 0­n1

1. What is thermonuclear fusion? Explain proton-proton cycle and the carbon-nitrogen cycle for thermonuclear fusion.
2. The effective Q for the proton-proton cycle is 26.2 MeV.
3. Express this energy per kilogram of hydrogen consumed.
4. The power of sun is 3.9 × 106 W. If its energy derived from the proton-proton cycle, at what rate it is losing hydrogen.
5. Calculate the rate at which it is losing mass.
6. Account for the difference in result for part B and C.
7. The half life of radium is 1500 years. In how many years will 1 gram of pure radium
8. Lose 1 mg.
9. Reduced to 10 mg.
10. The atomic ratio between uranium isotopes U238 and U234 in a mineral sample is found to be 1.8 × 104. The half life of U234 is 2.5 × 105 years. Find the mean life of U238.
11. How nuclear reaction are different than chemical reaction.
12. Write a short note on nuclear reactor, explaining the chain reactions.