1）In an AMS measurement of a carbon sample, 1000 counts due to transmitted 14C ions are recorded in 5 min. A beam of 10 μA is measured when the system is set to transmit 12C3+ ions. Calculate the atomic ratio of l4C/12C in the sample assuming that the transmissions of 14C and 12C ions through the system are the same. What mass of 12C was in the sample if it is totally consumed in half an hour? Assume a constant rate of consumption during this period and a system efficiency εof 2%.

2） A 100 mg foil of gold (197Au ) is placed in a thermal-neutron flux for 12 h. It is then set in front of a detector, which has an efficiency of 2 x 10-2 for detecting 412 keV γ rays. If the count rate in the detector, 6 h after irradiation, is 10 s-1, calculate the neutron flux near the foil.

The thermal-neutron capture cross section for 197Au is 99 b. The half-life of 198Au is 2.7 days and 95% of the time, its decay results in the emission of a 412 keV γ ray.