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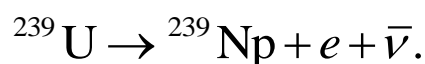
Problem 55.19 (RHK)

Many fear that helping additional nations develop nuclear power reactor technology will increase the likelihood of nuclear war because reactors can be used not only to produce energy but, as a by-product through neutron capture with inexpensive ^{238}U , to make ^{239}Pu , which is a “fuel” for nuclear bombs (breeder reactors). We have to identify simple series of reactions involving neutron capture and beta decay that would yield this plutonium isotope.



Solution:

A ^{238}U nucleus on neutron capture will form the isotope ^{239}U . The ^{239}U nucleus will undergo a beta decay and form ^{239}Np and the nuclear process will be



The ^{239}Np nucleus will undergo a beta decay and produce ^{239}Pu nuclide. The beta decay process will be



