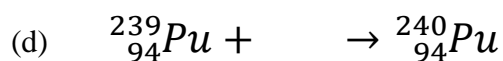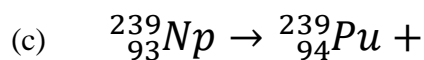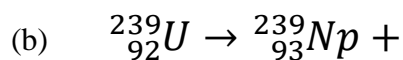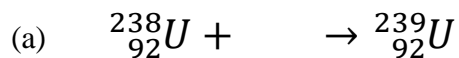# Exercise 2.3
Balancing Nuclear Reaction Equations

1.   Balance the equations for the following series of nuclear reactions by filling in the blanks.

(a) $^{238}_{92}U +$ _____ $\rightarrow\ ^{239}_{92}U$

(b) $^{239}_{92}U \rightarrow\ ^{239}_{93}Np +$ _____

(c) $^{239}_{93}Np \rightarrow\ ^{239}_{94}Pu +$ _____

(d) $^{239}_{94}Pu +$ _____ $\rightarrow\ ^{240}_{94}Pu$

(e) $^{240}_{94}Pu \rightarrow\ ^{236}_{92}U +$ _____
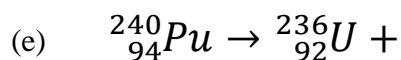
2. $^{240}_{94}Pu$ can also undergo spontaneous fission.

(a)   If the fission products are $^{100}_{40}Zr$, one other nuclide and two neutrons, what is the second nuclide?

(b)   What is unusual about this reaction?

3.   Write a balanced equation for each of the following nuclear reactions.

(a)   alpha emission by ^{110}Te

(b)   positron emission by ^{23}Mg

(c)   electron capture by ^{59}Ni

(d)   fusion of two ^{12}C nuclei to produce ^{20}Ne and one other product