Balancing Reactions

1. Balance the following reactions:

a. $^{73}Ga \rightarrow {}^{73}Ge + {}^{0}_{-1}e$

b. $^{238}U \rightarrow {}^{234}Th + {}^{4}_{2}He$

c. $^{201}Hg + {}^{0}_{-1}e \rightarrow {}^{201}Au + {}^{0}_{0}\gamma$

d. ${}^{1}_{0}n + {}^{235}U \rightarrow {}^{141}Ba + {}^{92}_{36}Kr + 3\,{}^{1}_{0}n$

2. What is a decay series?

this is when an unstable nucleus has to go through a number of decays in order to reach a stable configuration. For example:

$$^{238}_{92}U \rightarrow 14 \text{ steps} \rightarrow {}^{206}_{82}Pb$$

The 14 steps include 8 alpha and 6 beta emissions.

3. The isotope ^{247}Bk decays by a series of α particle and β particle emissions, eventually ending up as ^{207}Pb. In the complete decay series, how many α and β particles are produced?

The mass indicates the number of α particles needed:
247-207 = 40/4 = 10 α particles required.

The charge indicates the number of β particles needed:
97 = 10(2) + x(-1) + 82 → x = 5 β particles required

$$^{247}_{97}\text{Bk} \rightarrow 10\ ^{4}_{2}\alpha + 5\ ^{0}_{-1}\beta + ^{207}_{82}\text{Pb}$$