Answers

Some problems covering Chapter 11 material. You should be able to handle #1 and #2 now. These two questions cover material important to nuclear chemistry that was also part of Chapter 3. The remaining problems will be fairly easy once we finish lecturing on Chapter 11 or if you read sections 11.4 and 11.5 in the text.

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1. How many protons are in $^{90}_{38}Sr$? How many neutrons?

atomic #38 ⇒ 38p 90 − 38 = 52 neutrons.

2. How many protons and neutrons are in the nucleus of Db-265?

   a. 105 protons and 105 neutrons
   b. 105 protons and 160 neutrons
   c. 160 protons and 105 neutrons
   d. 160 protons and 265 neutrons
   e. 160 protons and 370 neutrons

↳ atomic #105

105 protons

265 − 105 = 160 neutrons

3. Complete the following nuclear reactions:

a) $^{137}_{55}Cs \rightarrow {}^{0}_{-1}e + {}^{137}_{56}X$?

atomic #56 is barium

$^{137}_{56}X$ is ^{137}Ba or barium-137

b) Alpha emission from neodymium-144

$^{144}_{60}Nd \longrightarrow {}^{4}_{2}He + {}^{140}_{58}X$

atomic #58, mass # 140

^{140}Ce or cerium-140

c) $^{10}_{5}B + (?) \rightarrow {}^{7}_{3}Li + {}^{4}_{2}He$

↳ $^{1}_{0}X$ which is a neutron ($^{1}_{0}n$)

4. The half-life of ^{18}F is about 100 minutes. If you started with 1.0 g of ^{18}F, how much would you have after 200 minutes passed?

   a. 3.0 g
   b. 1.0 g
   c. 0.50 g
   d. 0.25 g
   e. 6.0 g

$1.0_g \xrightarrow{100\,min} 0.5_g \xrightarrow{100\,min} 0.25_g$

5. How many half-lives would need to pass before 20.0 g of a radioactive material would be reduced to less than 1.0 grams?

$20.0_g \xrightarrow{1} 10.0_g \xrightarrow{2} 5.0_g \xrightarrow{3} 2.5_g \xrightarrow{4} 1.25_g \xrightarrow{5} 0.625_g$

5 half-lives needed