Nuclear Reactions Worksheet

1) The alpha decay of radon-198

2) The beta decay of uranium -237

3) Positron emission from silicon-26

4) Sodium-22 undergoes electron capture

5) What is the difference between nuclear fusion and nuclear fission?

6) What is a "mass defect" and why is it important?

7) $^{218}Po \rightarrow ? \ ^{214}Pb$

8) $^{212}Bi \rightarrow \beta^- + ?$

9) $? \rightarrow \alpha + ^{207}Tl$

10) $^{9}Be + ^{4}He \rightarrow ? + ^{1}n$

11) $? + ^{4}He \rightarrow ^{12}C + ^{6}Li$

12) $^{12}C + ? \rightarrow ^{1}H + ^{13}C$

13) The alpha decay of iridium-174

14) The beta decay of platinum-199

15) Positron emission from sulfur-31

16) Krypton-76 undergoes electron capture

17) If the half-life for the radioactive decay of zirconium-84 is 26 minutes and I start with a 175 gram sample, how much will be left over after 104 minutes?

18) $^{42}K \rightarrow \beta^- +$ _____

19) $^{239}Pu \rightarrow ^{4}He +$ _____

20) $^{9}Be \rightarrow ^{9}Be +$ _____

21) $^{235}U \rightarrow$ _____ $+ \ ^{231}Th$

22) $^{6}Li \rightarrow ^{4}He +$ _____

23) _____ $\rightarrow \ ^{142}Ba + \ ^{91}Kr + 3 \ ^{1}n$

Nuclear Chemistry Worksheet – Solutions

1) The alpha decay of radon-198
   194Po
2) The beta decay of uranium -237
   237Np
3) Positron emission from silicon-26
   26Al
4) Sodium-22 undergoes electron capture
   22Ne
5) What is the difference between nuclear fusion and nuclear fission?
   In nuclear fusion, small nuclei are combined to form a larger nucleus – this process releases a very large amount of energy, and is the main source of energy in the sun. In nuclear fission, large nuclei break apart to form smaller ones, releasing a large amount of energy. Fission is used in nuclear power plants to generate energy.
6) What is a "mass defect" and why is it important?
   "Mass defect" refers to the difference between the mass of the nucleons (protons + neutrons) in a nucleus when weighed separately and the mass of the nucleus when it's put together. This difference is important because this missing mass is converted to energy using E=mc2 that's used to hold the nucleus together.

7) $^{218}Po \rightarrow {}^{4}He \quad {}^{214}Pb$
8) $^{212}Bi \rightarrow \beta^{-} + {}^{212}Po$
9) $^{211}Bi \rightarrow \alpha + {}^{207}Tl$
10) $^{9}Be + {}^{4}He \rightarrow {}^{12}C + {}^{1}n$
11) $^{14}N + {}^{4}He \rightarrow {}^{12}C + {}^{6}Li$
12) $^{12}C + {}^{2}H \rightarrow {}^{1}H + {}^{13}C$

13) The alpha decay of iridium-
    $^{174}_{77}Ir \rightarrow {}^{4}_{2}He + {}^{170}_{75}\text{Re}$
14) The beta decay of platinum-199
    $^{199}_{78}Pt \rightarrow {}^{0}_{-1}e + {}^{199}_{79}Au$
15) Positron emission from sulfur-31
    $^{31}_{16}S \rightarrow {}^{31}_{15}P + {}^{0}_{+1}e$
16) Krypton-76 undergoes electron capture
    $^{76}_{36}Kr + {}^{0}_{-1}e \rightarrow {}^{76}_{35}Br$
17) If the half-life for the radioactive decay of zirconium-84 is 26 minutes and I start with a 175 gram sample, how much will be left over after 104 minutes?
    Since 104 minutes is equal to four half-lives, the amount of zirconium left over will be:

$$175\left(\frac{1}{2}\right)^{4} = 10.9 grams$$