Name:

Nuclear Chemistry Worksheet #1

Complete the following nuclear equations:

1. $^{187}_{75}\mathbf{Re} + \_\_\_\_\_ \rightarrow {}^{188}_{75}\mathbf{Re} + {}^{1}_{1}\mathbf{H}$

2. $^{9}_{4}\mathrm{Be} + {}^{4}_{2}\mathrm{He} \rightarrow {}^{1}_{0}\mathrm{n} + \_\_\_\_\_$

3. $^{22}_{11}\mathbf{Na} + \_\_\_\_\_ \rightarrow {}^{22}_{10}\mathbf{Ne}$

4. $^{238}_{93}\mathrm{Np} \rightarrow {}^{4}_{2}\mathrm{He} + \_\_\_\_\_$

Complete the following nuclear reactions and state the type of radioactive decay:

5. $^{202}_{80}\mathbf{Hg} \rightarrow {}^{198}_{78}\mathbf{Pt} + \_\_\_\_\_$

6. $^{232}_{91}\mathrm{Pa} \rightarrow \_\_\_\_\_ + {}^{0}_{-1}\beta$

7. $^{46}_{22}\mathbf{Ti} \rightarrow {}^{46}_{21}\mathbf{Sc} + \_\_\_\_\_$

8. Write an equation to represent the decay of curium-247 by alpha emission.

Answer the following questions.

9. The splitting of the nucleus into lighter nuclei is called_____.

10. When light mass nuclei combine to form a heavier, more stable nucleus this is called_____.

11. Do current nuclear power plants "harvest" energy from fusion or fission reactions? Why?

12. List two examples of fission reactions:

13. List two examples of fusion reactions:

14. List four types of nuclear waste:

Nuclear Chemistry Worksheet #2

Mass Defect and Nuclear Binding Energy Problems:

1. Calculate the nuclear binding energy of an atom if the mass defect is 0.000675kg.

2. Calculate the nuclear binding energy of an atom if the mass defect is 0.00888kg.

3. Calculate the nuclear binding energy of 1 mole of atoms if the mass defect is 0.0150kg.

Answer the following questions.

5. What unit is used to measure radiation exposure?

6. Name three devices used to detect radiation (or exposure to radiation):

7. Name three application of nuclear radiation:

Half Life Problems:

8. Assuming a half-life of 1599 years how many grams of radium-226 remain after 6396 years if the initial mass is 144 grams?

9. The half-life of cobalt-60 is 10.47 min. How many grams of cobalt-60 remain after 104.7 min if you start with 1024g?

10. The half-life of uranium-238 is $4.46X10^9$ years. If $4.46X10^9$ years pass how many grams of uranium-238 remain if the initial mass is 100.grams?

11. The half-life of polonium-218 is 3.0min. If you start with 16 mg, how long will it be before only 1.0 mg remains?

Nuclear Chemistry

Review all problems found on the Nuclear Chemistry Worksheet. Be able to define fission and fusion and list examples of each.

Complete the following nuclear equations:

1. $^{239}_{93}Np \rightarrow {}^{0}_{-1}\beta + $ _____

2. $^{9}_{4}Be + {}^{4}_{2}He \rightarrow$ _____

3. $^{32}_{15}P + $ _____ $\rightarrow {}^{33}_{15}P$

Complete the following nuclear reactions and state the type of radioactive decay:

4. $^{43}_{19}K \rightarrow {}^{43}_{20}Ca + $ _____

5. $^{233}_{92}U \rightarrow$ _____ $+ {}^{229}_{90}Th$

6. $^{11}_{6}C \rightarrow {}^{11}_{5}B + $ _____

7. Write the nuclear equation for the release of a beta particle by lead-210.

Mass Defect and Nuclear Binding Energy Problems:

8. The energy released by the formation of a nucleus of iron-56 is $7.89X10^{-11}J$. Determine the mass defect of iron-56. *Answer: $8.77X10^{-28}kg$*

9. Calculate the nuclear binding energy of an atom if the mass defect is 0.000799kg.

Half Life Problems:

11. The half-life of thorium-227 is 18.72 days. After 74.88 days how many grams remain if the initial mass is 88 grams?

12. The half-life of protactinium-234 is 6.69 hours. What mass in grams remain after 26.76 hours if the initial mass is 1000.grams?

14. The half-life of radium-224 is 3.66 days. What was the original mass of radium-224 if 25 grams remains after 7.32 days?