Chem 1 Hour\_\_\_\_ Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Wexler/Steinhorst  
Radioactive Decay Practice 1   
Date:

Reference: Glencoe Ch. 4.4 pp. 105-107

Answer the following questions:

**Part I. General**

1. What are isotopes of an element?

2. What determines whether or not the nucleus of an isotope will be stable? Invoke the concept of the stability belt (neutron:proton ratio as related to the number of protons).

3. How do unstable nuclei increase their stability?

4. Fill in the following table indicating the symbol, mass and charge of alpha, beta, and gamma radiation.   
(refer toTable 4-3 in textbook)

|  |  |  |  |
| --- | --- | --- | --- |
| Type of Radiation | Symbol | Mass | Charge |
| Alpha |  |  |  |
| Beta |  |  |  |
| Gamma |  |  |  |

**Part II. Alpha Decay**

5. Draw a diagram of an alpha particle

6. How is an alpha particle identical to the nucleus of a helium atom?

7. How is an alpha particle different from a helium atom?

8. How many protons are in an alpha particle?

9. How many neutrons are in an alpha particle?

10. How many electrons, if any, are in an alpha particle?

11. After alpha decay, what happens to the atomic number of the isotope?

12. Does the element change into a different one?

13. After alpha decay, what happens to the mass number of the isotope?

14. Write the nuclear equation for alpha decay of Polonium 209.   
Note: Po-209 has an atomic number (number of protons) of 84, and it has a mass number of 209 amu (sum of the protons and neutrons).

15. Write the nuclear equation alpha decay of Uranium 235 (U-235 has an atomic number of 92)

28pts

**Part III. Beta Decay**

16. What is a beta particle?

17. How is the beta particle formed? Does it come from the electron cloud or from something emitted from the nucleus?

18. When a beta particle is emitted, what happens to one of the neutrons in the nucleus of the isotope?

19. What happens to the atomic number of the isotope?

20. Does the element change to a different one?

21. What, if anything, happens to the mass number of the isotope? Explain.

22. Write the nuclear equation for beta decay of thorium-233 (atomic number = 90).

23. For beta-minus decay of thorium-233, what changes? Indicate yes or no to each of the following:

1. Atomic number \_\_\_\_\_\_
2. Atomic mass \_\_\_\_\_\_
3. Charge of the nucleus \_\_\_\_\_\_
4. The number of protons \_\_\_\_\_\_
5. The number of neutrons \_\_\_\_\_\_

24. Write the nuclear equation for beta decay of Radon-222.

**Part IV. Gamma Decay**

25. Is gamma radiation a particle (like alpha and beta), or is it pure energy (electromagnetic radiation)?

26. What is the effect of gamma decay on the number of protons?

27. What is the effect of gamma decay on the number of neutrons?

28. What is the effect of gamma decay on nuclear stability?

**Part V. Summary of Nuclear Changes due to Radioactive Decay**

29. What change in mass number (sum of the masses of the protons and neutrons) occurs when a radioactive atom emits:

1. An alpha particle?
2. A beta-minus particle?
3. A gamma ray?

30. What change in atomic number (number of protons) occurs when a radioactive atom emits:   
   
 A. An alpha particle?

B. A beta-minus particle?

C. A gamma ray?