

**Unit 12: Nuclear Chemistry**

Name: \_\_\_\_\_  
*Text Questions from Corwin*

1. With regard to nuclear energy, what are two major problems of public concern?
2. Nuclear power makes up about what percentage of the electrical power needs of...  
...the world?      ...the United States?      ...China?      ...France?

18.1

3. What does a radioactive element emit?
4. Describe each of the three main types of radiation. Also, include the symbol for each one.

18.2

5. Draw a diagram to show what is indicated by atomic notation. Label each part.
6. What does the term nuclide refer to?
7. How do chemical and nuclear reactions differ?
8. What does a nuclear reaction involve?
9. What two things must be accounted for in writing a balanced nuclear equation?

10. Complete the following, based on Table 18.2.

<b>Particle</b>	<b>Notation</b>	<b>Mass</b>
alpha, $\alpha$		
beta, $\beta^-$		
gamma, $\gamma$		
positron, $\beta^+$		
neutron, $n^0$		
proton, $p^+$		

11. In beta emission, a neutron decays...
12. Relative to the periodic table, what element is produced in beta emission?

13. A. What effect does gamma emission have on a nuclear equation?  
B. Why are gamma rays included in nuclear equations?

14. The term positron comes from a merging of the terms \_\_\_\_\_, and is an example of \_\_\_\_\_.

15. In positron emission, a proton decays...

16. What happens in electron capture?

18.3

17. What is a radioactive decay series?

18. What does the term parent-daughter nuclides refer to?

19. What happens to the atomic number after...      ...an alpha emission?      ...a beta emission?

18.4

20. What is meant by the activity of a radioactive sample?

21. What have scientists observed about radioactivity levels?

22. What is the half-life, and what is its symbol?

23. Each time one half-life elapses, the activity...

24. Why is disposing of radioactive waste material a major concern?

18.5

25. What is a radionuclide?

26. The fact that carbon-14 is unstable means what?

27. What is the fundamental assumption of radiocarbon dating?

28. Carbon-14 is produced in the upper \_\_\_\_\_. \_\_\_\_\_ rays strike molecules and scatter high-energy \_\_\_\_\_, which collide with \_\_\_\_\_; the products are \_\_\_\_\_ and \_\_\_\_\_. The C-14 atoms produced react with \_\_\_\_\_ to yield radioactive \_\_\_\_\_, which later becomes incorporated into plant and animal life.

29. Carbon-14 emits \_\_\_\_\_ radiation according to the equation...

30. What is the half-life of carbon-14?

31. A. What provides an estimate of the age of very old geological events?

B. What ratio corresponds to one half-life of U-238?

32. How can insect populations be controlled using radiation?

33. What does gamma irradiation do to processed foods?

18.6

34. What happens if a nuclide is bombarded with an atomic particle? What term describes this change?

35. Who discovered the first transmutation reaction, and when?

36. How were the transuranium elements synthesized?

37. Why are linear accelerators and cyclotrons sometimes called "atom smashers"?

18.7

38. What is nuclear fission?

39. List three nuclides that are fissionable (i.e., can undergo fission).

40. What induces the fission process?

41. A. What is released, for each nucleus that undergoes fission?

B. The emitted neutrons can cause...

42. Why is a large mass of the fissionable nuclide needed for a chain reaction to occur?

43. What is the critical mass?

44. Natural uranium is only about \_\_\_\_\_ fissionable U-235. The rest is nonfissionable \_\_\_\_\_. To obtain a chain reaction, it is necessary to \_\_\_\_\_ the mixture to about \_\_\_\_\_ U-235.

45. Why is it possible to physically separate  $^{235}\text{UF}_6$  and  $^{238}\text{UF}_6$  by gaseous diffusion?

18.8

46. What is nuclear fusion?

47. Why is fusion a cleaner process than fission?

48. In terms of nuclear energy, what is the Sun?

49. Why are extreme temperatures needed for nuclear fusion?

50. What is a major practical problem, with regard to using fusion to generate electricity?

51. If used in the generation of energy by fusion, one cubic mile of seawater has more energy than...