3–3 Practice Problems, pages 19-20

Answers marked with an asterisk denote additional practice problems that appear in the Teacher's Edition.

*1. 23 protons and 23 electrons
*2. 7 protons and 7 electrons
3. 18 protons and 18 electrons
4. 19 protons and 19 electrons
5. 78 protons and 78 electrons
6. boron
7. chlorine
8. manganese
9. lead
10. uranium
*11. Mg^{2+}
*12. W^{6+}
13. Am^{6+}
14. As^{3-}
15. Cu^{2+}
*16. 28 protons, 31 neutrons, and 26 electrons
*17. 40 protons, 51 neutrons, and 36 electrons
18. 58 protons, 82 neutrons, and 55 electrons
19. 34 protons, 45 neutrons, and 36 electrons
20. 21 protons, 24 neutrons, and 18 electrons
21. 6 protons, 7 neutrons, and 10 electrons
22. $^{209}_{84}Po^{4+}$
23. $^{59}_{27}Co^{2+}$
24. $^{181}_{73}Ta^{5+}$
25. $^{70}_{31}Ga^{3+}$

3–4 Practice Problems, page 25

Answers marked with an asterisk denote additional practice problems that appear in the Teacher's Edition.

*1. $^{231}_{91}Pa \rightarrow {}^{227}_{89}Ac + {}^{4}_{2}\alpha$
*2. $^{223}_{87}Fr \rightarrow {}^{223}_{88}Ra + {}^{0}_{-1}\beta$
3. $^{149}_{62}Sm \rightarrow {}^{145}_{60}Nd + {}^{4}_{2}\alpha$
4. $^{165}_{61}Pm \rightarrow {}^{165}_{62}Sm + {}^{0}_{-1}\beta$
5. $^{249}_{101}Md \rightarrow {}^{245}_{99}Es + {}^{4}_{2}\alpha$
6. $^{146}_{62}Sm \rightarrow {}^{142}_{60}Nd + {}^{4}_{2}\alpha$
7. $^{198}_{85}At \rightarrow {}^{198}_{86}Rn + {}^{0}_{-1}\beta$
8. $^{150}_{64}Gd \rightarrow {}^{146}_{62}Sm + {}^{4}_{2}\alpha$
9. $^{152}_{54}Xe \rightarrow {}^{152}_{55}Cs + {}^{0}_{-1}\beta$
10. $^{120}_{55}Cs \rightarrow {}^{120}_{56}Ba + {}^{0}_{-1}\beta$

3–4 Apply, page 26

Reaction 1: $^{13}_{7}N$

Reaction 2: $^{13}_{6}C$

Reaction 3: $^{13}_{6}C$

Reaction 4: $^{14}_{7}N$

Reaction 5: $^{15}_{7}N$

Reaction 6: $^{12}_{6}C$

2. a. $^{0}_{+1}e$ (positron)

   b. $^{4}_{2}He$ (alpha particle)

3. The nitrogen nuclei enter the next reaction and undergo radioactive decay.

4. Carbon-12 produced by the sixth reaction becomes a reactant in the first reaction.

5. The product of each reaction becomes the reactant in the next reaction. The carbon-12 produced in the sixth reaction becomes the reactant in the first step, thus beginning the cycle again.