

4.3 (a) 2 (b) 2 (c) 3 (d) 4 **4.5** (a) Group IA, 1 valence electron
(b) Group VIIIA, 8 valence electrons (c) Group IIA, 2 valence electrons
(d) Group VIIA, 7 valence electrons **4.7** (a) $1s^2 2s^2 2p^2$
(b) $1s^2 2s^2 2p^5$ (c) $1s^2 2s^2 2p^6 3s^2$ (d) $1s^2 2s^2 2p^6 3s^2 3p^3$

4.13 They are the most unreactive of all elements. **4.15** They lose, gain, or share electrons in such a way that they achieve a noble-gas electron configuration. **4.17** (a) O^{2-} (b) Mg^{2+} (c) F^- (d) Al^{3+}

4.19 (a) Ca^{2+} (b) O^{2-} (c) Na^+ (d) Al^{3+} **4.21** (a) 15p, 18e (b) 7p, 10e
(c) 12p, 10e (d) 3p, 2e **4.23** line 1: 18 electrons, 20 protons; line 2: Be, 4 protons; line 3: I, I^- ; line 4: Al^{3+} , 10 electrons **4.25** (a) ${}^{14}_6\text{C}$ (b) ${}^{27}_{13}\text{Al}^{3+}$
(c) ${}^{35}_{17}\text{Cl}^-$ (d) ${}^{52}_{24}\text{Cr}$ **4.27** (a) 2+ (b) 3- (c) 1+ (d) 1- **4.29** (a) 2 lost

(b) 1 gained (c) 2 lost (d) 2 gained **4.31** (a) Ne (b) Ar (c) Ar (d) Ar
4.33 (a) Ne (b) Ar (c) Ar (d) Ar **4.35** (a) Group IIA (b) Group VIA
 (c) Group VA (d) Group IA **4.37** (a) $1s^2 2s^2 2p^6 3s^2 3p^1$ (b) $1s^2 2s^2 2p^6$

4.41 (a) 2 extra electrons, 2- charge (b) 1 extra electron, 1- charge
(c) 3 extra electrons, 3- charge (d) 2 extra electrons, 2- charge

4.43 (a) BaCl_2 (b) BaBr_2 (c) Ba_3N_2 (d) BaO **4.45** (a) MgF_2 (b) BeF_2
(c) LiF (d) AlF_3 **4.47** (a) Na_2S (b) CaI_2 (c) Li_3N (d) AlBr_3

4.49 (a) BeCl_2 (b) BaI_2 (c) Na_2O (d) AlN **4.51** an extended array of alternating positive and negative ions **4.53** smallest whole-number

repeating ratio of ions present **4.55** (a) diagram III (2:3 ratio) (b) diagram IV (1:2 ratio) (c) diagram I (3:1 ratio) (d) diagram II (1:1 ratio)

4.57 all pairs except nitrogen and chlorine **4.59** Al_2O_3 and K_2S

4.61 (a) potassium iodide (b) beryllium oxide (c) aluminum fluoride
(d) sodium phosphide **4.63** (a) +1 (b) +2 (c) +4 (d) +2

4.65 (a) iron(II) oxide (b) gold(III) oxide (c) copper(II) sulfide

(d) cobalt(II) bromide **4.67** (a) gold(I) chloride (b) potassium chloride
(c) silver chloride (d) copper(II) chloride **4.69** (a) KBr (b) Ag₂O

(c) BeF_2 (d) Ba_3P_2 **4.71** (a) CoS (b) Co_2S_3 (c) SnI_4 (d) Pb_3N_2

4.73 (a) SO_4^{2-} (b) ClO_3^- (c) OH^- (d) CN^- **4.75** (a) PO_4^{3-} and HPO_4^{2-} (b) NO_3^- and NO_2^- (c) H_3O^+ and OH^- (d) CrO_4^{2-} and $\text{Cr}_2\text{O}_7^{2-}$

4.77 (a) NaClO_4 (b) $\text{Fe}(\text{OH})_3$ (c) $\text{Ba}(\text{NO}_3)_2$ (d) $\text{Al}_2(\text{CO}_3)_3$ **4.79** line 1: NH_4CN , NH_4NO_3 , NH_4HCO_3 , $(\text{NH}_4)_2\text{SO}_4$; line 2: $\text{Al}(\text{CN})_3$, $\text{Al}(\text{NO}_3)_3$, $\text{Al}(\text{HCO}_3)_3$, $\text{Al}_2(\text{SO}_4)_3$; line 3: AgCN , AgHCO_3 , Ag_2SO_4 ; line 4: $\text{Ca}(\text{CN})_2$, $\text{Ca}(\text{NO}_3)_2$, $\text{Ca}(\text{HCO}_3)_2$, CaSO_4 **4.81** (a) magnesium carbonate (b) zinc

sulfate (c) beryllium nitrate (d) silver phosphate **4.83** (a) iron(II) hydroxide (b) copper(II) carbonate (c) gold(I) cyanide (d) manganese(II)

phosphate **4.85** (a) KHCO_3 (b) $\text{Au}_2(\text{SO}_4)_3$ (c) AgNO_3 (d) $\text{Cu}_3(\text{PO}_4)_2$

4.87 line 1: Mg^{2+} , OH^- , $\text{Mg}(\text{OH})_2$; line 2: Ba^{2+} , Br^- , barium bromide; line 3: $\text{Zn}(\text{NO}_3)_2$, zinc nitrate; line 4: Fe^{3+} , ClO_3^- , $\text{Fe}(\text{ClO}_3)_3$; line 5: Pb^{4+} , O^{2-} , lead(IV) oxide; line 6: $\text{Co}_3(\text{PO}_4)_2$, cobalt(II) phosphate; line 7: KI , potassium iodide; line 8: Cu^+ , SO_4^{2-} , copper(I) sulfate; line 9: Li^+ , N^{3-} , Li_3N ; line 10: Al_2S_3 , aluminum sulfide **4.88** line 1: 26. 33. 23.

3+; line 2: $^{59}_{28}\text{Ni}^{3+}$, 3+; line 3: $^{197}_{77}\text{Ir}^{2+}$, 75; line 4: $^{18}_9\text{F}^{-}$, 9 **4.89** (a) Na^{+}
(b) F^{-} (c) S^{2-} (d) Ca^{2+} **4.90** (a) XZ_2 (b) X_2Z (c) XZ (d) XZ **4.91** (a)

4.92 (a) only monatomic ions (b) both monatomic and polyatomic ions (c) only polyatomic ions (d) only

monatomic ions **4.93** (a) K^+ , Cl^- (b) Ca^{2+} , S^{2-} (c) Be^{2+} , two F^-

(d) two Al^{3+} , three S^{2-} **4.94** (a) Na_3N , sodium nitride (b) KNO_3 , potassium nitrate (c) MgO , magnesium oxide (d) $(\text{NH}_4)_3\text{PO}_4$, ammonium

phosphate **4.95** (a) tin(IV) chloride, tin(II) chloride (b) iron(II) sul

iron(III) sulfide (c) copper(I) nitride, copper(II) nitride (d) nickel(II) iodide, nickel(III) iodide **4.96** (a) same (3+) (b) different (1+ and 2+)

(c) different (1+ and 3+) (d) different (2+ and 1+) **4.97** (a) copper(I) nitrate, copper(II) nitrate (b) lead(II) phosphate, lead(IV) phosphate

(c) manganese(III) cyanide, manganese(II) cyanide (d) cobalt(II) chlorate
cobalt(III) chlorate **4.98** (a) Na_2S (b) Na_2SO_4 (c) Na_2SO_3 (d) $\text{Na}_2\text{S}_2\text{O}_3$

4.99 a 4.100 d 4.101 d 4.102 c 4.103 a 4.104 b 4.105 a

4.106 d 4.107 c 4.108 a