

## Chapter 7

### Answers to Questions

1. (a)  $S^{2-}$  (b)  $Ca^{2+}$  (c)  $I^-$
2. (a)  $Al^{3+}$  (b)  $P^{3-}$  (c)  $Sn^{2+}$
3. (a) cobalt(II) (b) potassium (c) nitride
4. (a) fluoride (b) mercury(II) (c) cadmium
5. (a) The sodium ion is  $Na^+$  and sulfide ion is  $S^{2-}$ , so the compound is  $Na_2S$ . As there is only one possible combination, the ionic compound is named sodium sulfide.  
  
(b) The aluminum ion is  $Al^{3+}$  and the phosphide ion is  $P^{3-}$ , so the compound is  $AlP$ . As there is only one combination, the ionic compound is named aluminum phosphide.  
  
(c) The nickel ion is  $Ni^{2+}$  and the bromide ion is  $Br^-$ , so to balance the charges, the formula is  $NiBr_2$ . The  $Ni^{2+}$  ion is named nickel(II) so the ionic compound is named nickel(II) bromide.  
  
(d) Lead can form two ions,  $Pb^{2+}$  named lead(II) and  $Pb^{4+}$  named lead(IV). The oxide ion is  $O^{2-}$ . So to balance the charges, the two ionic compounds are  $PbO$  and  $PbO_2$ . The corresponding names are lead(II) oxide and lead(IV) oxide.
6. (a) The calcium ion is  $Ca^{2+}$  and the chloride ion is  $Cl^-$ , so the compound is  $CaCl_2$ . As there is only one possible combination, the ionic compound is named calcium chloride.  
  
(b) The zinc ion is  $Zn^{2+}$  and the nitride ion is  $N^{3-}$ , so the compound will be  $Zn_3N_2$ . As there is only one possible combination, the ionic compound is named zinc nitride.  
  
(c) The magnesium ion is  $Mg^{2+}$  and the iodide ion is  $I^-$ , so the compound will be  $MgI_2$ . As there is only one possible combination, the ionic compound is named magnesium iodide  
  
(d) Iron can form two ions,  $Fe^{2+}$  named iron(II) and  $Fe^{3+}$  named iron(III). The oxide ion is  $O^{2-}$ . So to balance the charges, the two ionic compounds are  $FeO$  and  $Fe_2O_3$ . The corresponding names are iron(II) oxide and iron(III) oxide.

7. (a) Mercury can form  $\text{Hg}^+$  and  $\text{Hg}^{2+}$  ions. Oxygen only forms the oxide ion  $\text{O}^{2-}$ . So with the formula of  $\text{HgO}$ , the compound must contain the  $\text{Hg}^{2+}$  ion. The name is mercury(II) oxide.
- (b) Lithium only forms the  $\text{Li}^+$  ion, so the compound is simply named lithium oxide.
- (c) Copper can form  $\text{Cu}^+$  and  $\text{Cu}^{2+}$  ions. Oxygen only forms the oxide ion  $\text{O}^{2-}$ . So with the formula  $\text{Cu}_2\text{O}$ , the compound must contain the  $\text{Cu}^+$  ion. The name is copper(I) oxide.
8. (a) Iron can form  $\text{Fe}^{2+}$  and  $\text{Fe}^{3+}$ . Sulfur only forms the sulfide ion  $\text{S}^{2-}$ . So with the formula of  $\text{FeS}$ , the compound must contain the  $\text{Fe}^{2+}$  ion. The name is iron(II) sulfide.
- (b) Strontium only forms the  $\text{Sr}^{2+}$  ion, so the compound is simply named strontium sulfide.
- (c) Aluminum only forms the  $\text{Al}^{3+}$  ion, so the compound is simply named aluminum sulfide.
9. (a) For covalent compounds, the appropriate numerical prefixes are used. The name is dichlorine heptaoxide.
- (b) For covalent compounds, the appropriate numerical prefixes are used. The name is iodine heptafluoride.
- (c) For covalent compounds, the appropriate numerical prefixes are used. The name is xenon tetraoxide (or tetroxide).
10. (a) For covalent compounds, the appropriate numerical prefixes are used. The name is sulfur trioxide.
- (b) For covalent compounds, the appropriate numerical prefixes are used. The name is phosphorus pentafluoride.
- (c) For covalent compounds, the appropriate numerical prefixes are used. The name is dinitrogen trisulfide.
11. (a) Tetra- is 4 and deca- is 10. The formula is  $\text{P}_4\text{O}_{10}$ .
- (b) Di- is 2. The formula is  $\text{S}_2\text{Cl}_2$ .

12. (a) Di- is 2 and penta- is 5. The formula is  $I_2O_5$
- (b) Tetra- is 4. The formula is  $CCl_4$
13. (a) This is a combination of a metal and a nonmetal. The ionic naming system must be used. Tin can be  $Sn^{2+}$  or  $Sn^{4+}$ . Oxide is always  $O^{2-}$ . As the formula is  $SnO_2$ , it must be  $Sn^{4+}$ . The name is tin(IV) oxide.
- (b) This is a combination of two nonmetals. The covalent naming system must be used. The name is silicon dioxide.
14. (a) This is a combination of two nonmetals. The covalent naming system must be used. The name is chlorine trifluoride.
- (b) This is a combination of a metal and a nonmetal. Aluminum is always  $Al^{3+}$ . Fluoride is always  $F^-$ . The name is aluminum fluoride.
15. (a)  $MnO_4^-$  (b)  $NO_3^-$
16. (a)  $CO_3^{2-}$  (b)  $PO_4^{3-}$
17. (a)  $ClO^-$  (b)  $CN^-$
18. (a)  $NH_4^+$  (b)  $ClO_4^-$
19. (a) Calcium ion is  $Ca^{2+}$  and the hydroxide ion is  $OH^-$ . The formula of the ionic compound is  $Ca(OH)_2$ .
- (b) Mercury(I) ion is  $Hg^+$  and the sulfate ion is  $SO_4^{2-}$ . The formula of the ionic compound is  $Hg_2SO_4$ .
20. (a) Potassium ion is  $K^+$  and the chlorate ion is  $ClO_3^-$ . The formula of the ionic compound is  $KClO_3$ .
- (b) Iron(III) ion is  $Fe^{3+}$  and the phosphate ion is  $PO_4^{3-}$ . The formula of the ionic compound is  $FePO_4$ .
21. (a) "Ni" is always  $Ni^{2+}$  and is named nickel(II). "NO<sub>3</sub>" is the nitrate ion,  $NO_3^-$ . The name of the ionic compound is nickel(II) nitrate.

- (b) "Mg" is always  $\text{Mg}^{2+}$  and is named magnesium. " $\text{CO}_3$ " is the carbonate ion,  $\text{CO}_3^{2-}$ . The name of the ionic compound is magnesium carbonate.
22. (a) "Ba" is always  $\text{Ba}^{2+}$  and is named barium. " $\text{SO}_3$ " is the sulfite ion,  $\text{SO}_3^{2-}$ . The name of the ionic compound is barium sulfite.
- (b) "K" is always  $\text{K}^+$  and is named potassium. " $\text{MnO}_4$ " is the permanganate ion,  $\text{MnO}_4^-$ . The name of the ionic compound is potassium permanganate.
23. (a) The ionic compound is that of the  $\text{Zn}^{2+}$  ion with the  $\text{SO}_4^{2-}$  ion, that is,  $\text{Zn}(\text{SO}_4)$ . The polyatomic ion is sulfate.
- (b) The ionic compound is that of the  $\text{Ca}^{2+}$  ion with the  $\text{CrO}_4^{2-}$  ion, that is,  $\text{Ca}(\text{CrO}_4)$ . The polyatomic ion is chromate.
24. (a) The ionic compound is that of the  $\text{NH}_4^+$  ion with the  $\text{I}^-$  ion, that is,  $(\text{NH}_4)\text{I}$ . The polyatomic ion is ammonium.
- (b) The ionic compound is that of the  $\text{Li}^+$  ion with the  $\text{OH}^-$  ion, that is,  $\text{Li}(\text{OH})$ . The polyatomic ion is hydroxide.
25. Iron forms  $\text{Fe}^{2+}$  and  $\text{Fe}^{3+}$ . Sulfate is  $\text{SO}_4^{2-}$ . The two ionic compounds are  $\text{FeSO}_4$  and  $\text{Fe}_2(\text{SO}_4)_3$ .
26. Lead forms  $\text{Pb}^{2+}$  and  $\text{Pb}^{4+}$ . Nitrate is  $\text{NO}_3^-$ . The two ionic compounds are  $\text{Pb}(\text{NO}_3)_2$  and  $\text{Pb}(\text{NO}_3)_4$ .
27. (a) The ionic compound is that of the  $\text{Ca}^{2+}$  ion with the  $\text{HCO}_3^-$  ion. The name of the ionic compound is calcium hydrogen carbonate.
- (b) The ionic compound is that of the  $\text{Na}^+$  ion with the  $\text{H}_2\text{PO}_4^-$  ion. The name of the ionic compound is sodium dihydrogen phosphate.
28. (a) Potassium ion is  $\text{K}^+$  and the hydrogen sulfite ion is  $\text{HSO}_3^-$ . The formula of the ionic compound is  $\text{KHSO}_3$ .
- (b) Calcium ion is  $\text{Ca}^{2+}$  and the hydrogen phosphate ion is  $\text{HPO}_4^{2-}$ . The formula of the ionic compound is  $\text{CaHPO}_4$ .

