1. Define the term “isoelectronic.”

2. Which of the following compounds are ionic?
   a) SiCl₄   b) ScCl₃   c) NCl₃   d) NH₄Cl

3. Which of the following compounds are ionic?
   a) KCN   b) HNO₂   c) CoPO₄   d) NH₄NO₂

4. Metals and nonmetals tend to achieve noble gas configurations. In each case, explain how they do it?

5. What are the charges on the ions formed by the main group elements?

6. How many ions are in the formula of a compound composed of a 2A metal and a 7A nonmetal? Give two examples of compounds with this type of formula.

7. Oxygen can have a positive oxidation state when bound to only one element. What is the element? Use orbital energies to explain.

8. Use orbital energies to explain why hydrogen is -1 when bound to metals and +1 when bound to nonmetals.

9. Which element in each pair would have the positive oxidation state.
   a) N & O   b) Cl & P   c) S & Sn   d) K & N

10. Which element in each pair would have the positive oxidation state.
    a) N & H   b) C & O   c) S & Ca   d) F & O

11. Write electron configurations for the following ions.
    a) Ca²⁺   b) Ga³⁺   c) Co³⁺   d) I⁻

12. Write electron configurations for the following ions.
    a) Te²⁻   b) P³⁻   c) Pb²⁺   d) In¹⁺

13. Explain the following observations.
    a) K¹⁺ is larger than Na¹⁺.
    b) Na is larger than Cl, but Na¹⁺ is much smaller than Cl¹⁺.
    c) Lead forms two oxides, PbO and PbO₂.

14. Determine the oxidation state of the underlined atom.
    a) KMnO₄   b) C₁₂H₂₂O₁₁   c) CoPO₄   d) Na₂O₂

15. Determine the oxidation state of the underlined atom.
    a) C₅₀   b) LiAlH₄   c) OF₂   d) CaSiO₃

16. Name the following compounds:
    a) CaCl₂   b) Fe(NO₃)₂   c) K₂CO₃   d) CoCl₃

17. Name the following compounds:
    a) Zn₃(PO₄)₂   b) Ag₂S   c) Cr₂O₃   d) NH₄Cl

18. Name the following ionic compounds using the “hydrogen” prefix for the anion:
    a) KHSO₄   b) NaH₂PO₄   c) Li₂HPO₄   d) Co(HSO₃)₂

19. What two names can be used for Ca(HCO₃)₂?

20. Predict the formulas of the arsenate and arsenite ions.

21. Predict the formulas of the vanadate and titanate ions.

22. Consider the compound formed between X and Y.
    a) What is the formula of the ionic compound formed between these two elements?
    b) What is the oxidation state of X in the compound?
    c) What is the oxidation state of Y in the compound?

23. Consider the compound formed between Y and Z.
    a) What are the maximum and minimum oxidation states of Y?
    b) What are the maximum and minimum oxidation states of Z?
    c) What is the formula of the compound that is most likely formed between atoms Y and Z in their maximum and minimum oxidation states?

24. Elements X, Y, and Z are all main group elements. In which groups are they located? (See Exercises 22 and 23.)
Chapter 4 Exercises

25. Write formulas for the following compounds:
   a) gallium(III) oxide
   b) strontium bromide
   c) zinc acetate
   d) manganese(II) sulfide

26. Write formulas for the following compounds:
   a) strontium phosphide
   b) potassium dichromate
   c) platinum(IV) oxide
   d) aluminum nitrate

27. Write formulas for the following compounds:
   a) sodium bicarbonate
   b) iron(II) hydrogensulfate
   c) calcium dihydrogenphosphate
   d) magnesium hydrogensulfite

28. What is the mass of 0.057 mol of magnesium chlorate?

29. How many moles of iron(III) oxide are present in a 5.00 g sample?

30. How many moles of oxygen atoms are present in 0.20 mol aluminum dichromate?

31. A sample of calcium nitrate contains 0.025 mol of oxygen atoms. What is the mass of the sample?

32. How many moles of bicarbonate ions are present in 12.0 g of aluminum bicarbonate?

33. How many moles of protons are required to convert all of the phosphate ions in 25.0 g of magnesium phosphate into dihydrogen phosphate ions?

34. How many moles of electrons would be required to convert 10.0 g of phosphorus atoms into phosphide ions?

35. How many moles of electrons must be removed to convert 7.5 g Zn to zinc ions?