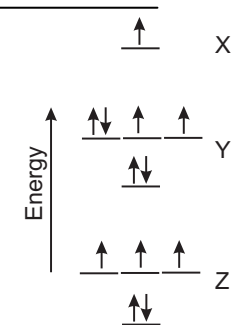


## Chapter 4 Exercises

- Define the term "isoelectronic."
- Which of the following compounds are ionic?  
a)  $\text{SiCl}_4$       b)  $\text{ScCl}_3$       c)  $\text{NCl}_3$       d)  $\text{NH}_4\text{Cl}$
- Which of the following compounds are ionic?  
a)  $\text{KCN}$       b)  $\text{HNO}_2$       c)  $\text{CoPO}_4$       d)  $\text{NH}_4\text{NO}_2$
- Metals and nonmetals tend to achieve noble gas configurations. In each case, explain how they do it?
- What are the charges on the ions formed by the main group elements?
- 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.
- Oxygen can have a positive oxidation state when bound to only one element. What is the element? Use orbital energies to explain.
- Use orbital energies to explain why hydrogen is -1 when bound to metals and +1 when bound to nonmetals.
- Which element in each pair would have the positive oxidation state.  
a) N & O      b) Cl & P      c) S & Sn      d) K & N
- Which element in each pair would have the positive oxidation state.  
a) N & H      b) C & O      c) S & Ca      d) F & O
- Write electron configurations for the following ions.  
a)  $\text{Ca}^{2+}$       b)  $\text{Ga}^{3+}$       c)  $\text{Co}^{3+}$       d)  $\text{I}^{1-}$
- Write electron configurations for the following ions.  
a)  $\text{Te}^{2-}$       b)  $\text{P}^{3-}$       c)  $\text{Pb}^{2+}$       d)  $\text{In}^{1+}$
- Explain the following observations.  
a)  $\text{K}^{1+}$  is larger than  $\text{Na}^{1+}$ .  
b) Na is larger than Cl, but  $\text{Na}^{1+}$  is much smaller than  $\text{Cl}^{1-}$ .  
c) Lead forms two oxides,  $\text{PbO}$  and  $\text{PbO}_2$ .
- Determine the oxidation state of the underlined atom.  
a)  $\text{K}\underline{\text{Mn}}\text{O}_4$       b)  $\underline{\text{C}}_{12}\text{H}_{22}\text{O}_{11}$       c)  $\underline{\text{C}}\text{oPO}_4$       d)  $\underline{\text{N}}\text{a}_2\text{O}_2$
- Determine the oxidation state of the underlined atom.  
a)  $\underline{\text{C}}_{60}$       b)  $\text{Li}\underline{\text{Al}}\text{H}_4$       c)  $\underline{\text{O}}\text{F}_2$       d)  $\text{Ca}\underline{\text{Si}}\text{O}_3$
- Name the following compounds:  
a)  $\text{CaCl}_2$       b)  $\text{Fe}(\text{NO}_3)_2$       c)  $\text{K}_2\text{CO}_3$       d)  $\text{CoCl}_3$
- Name the following compounds:  
a)  $\text{Zn}_3(\text{PO}_4)_2$       b)  $\text{Ag}_2\text{S}$       c)  $\text{Cr}_2\text{O}_3$       d)  $\text{NH}_4\text{Cl}$
- Name the following ionic compounds using the "hydrogen" prefix for the anion:  
a)  $\text{KHSO}_4$       b)  $\text{NaH}_2\text{PO}_4$       c)  $\text{Li}_2\text{HPO}_4$       d)  $\text{Co}(\text{HSO}_3)_2$
- What two names can be used for  $\text{Ca}(\text{HCO}_3)_2$ ?
- Predict the formulas of the arsenate and arsenite ions.
- Predict the formulas of the vanadate and titanate ions.

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Use the energy diagram for the valence orbitals of atoms X, Y, and Z shown to the right in Exercises 22, 23, and 24.



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