

Chemical Bonds Review Answer Key

Ionic Compounds

1. Why do atoms bond?

Quick Answer: to achieve octet and become stable (know what this means!)

2. What is the difference between an ionic and a covalent bond? How does each type form?

See Ch. 8 Section 1 and Ch. 9 Section 1

3. List some properties of ionic bonds.

Ch 8 Section 1

4. List some properties of covalent bonds.

Ch 9 Section 1

5. Be able to predict the formation of ions and write the appropriate electron configurations.

6. What is oxidation number? What is the oxidation number of Fe^{+2} , Fe^{+3} , Pb^{+4} , V^{+5} ?

Ch 9 Section 3 (I think); also in the ionic nomenclature notes

7. Be able to identify common polyatomic ions. **Study your ions sheet!!!!**

8. Identify the following ions:

- | | |
|------------------|------------------------------------|
| a. bromide ion | Br^- |
| b. phosphide ion | P^{-3} |
| c. barium ion | Ba^{+2} |
| d. rubidium ion | Rb^{+1} |

e. aluminum ion	Al^{+3}
f. oxide ion	O^{-2}
g. lead (II) ion	Pb^{+2}
h. tin (IV) ion	Sn^{+4}
i. silver (I) ion	Ag^{+}
j. mercury (II) ion	Hg^{+2}
k. ammonium	NH_4^{+}
l. nitrate	NO_3^{-}
m. nitrite	NO_2^{-}
n. cyanide	CN^{-}
o. permanganate	MnO_4^{-}
p. chromate	CrO_4^{-2}
q. dichromate	$\text{Cr}_2\text{O}_7^{-2}$
r. sulfate	SO_4^{-2}
s. phosphate	PO_4^{-3}

You need to know how to predict ions from the periodic table AND you need to know the polyatomic ions on the sheet!!!

9. Write the formulas and the names for the ionic compounds made from the following pairs of ions.

a. $\text{Ca}^{2+}, \text{P}^{3-}$	Ca_3P_2	calcium phosphide
b. $\text{K}^{+}, \text{Cl}^{-}$	KCl	potassium chloride
c. $\text{Ca}^{2+}, \text{S}^{2-}$	CaS	calcium sulfide
d. $\text{Al}^{3+}, \text{N}^{3-}$	AlN	aluminum nitride
e. $\text{Sn}^{4+}, \text{O}^{2-}$	SnO_2	tin (IV) oxide
f. $\text{Mg}^{2+}, \text{N}^{3-}$	Mg_3N_2	magnesium nitride
g. $\text{Ag}^{+}, \text{O}^{2-}$	Ag_2O	silver (I) oxide

h. $\text{Fe}^{2+}, \text{S}^{2-}$	FeS	iron (II) sulfide
i. $\text{Ca}^{2+}, \text{NO}_3^-$	$\text{Ca}(\text{NO}_3)_2$	calcium nitrate
j. $\text{K}^+, \text{SO}_4^{2-}$	K_2SO_4	potassium sulfate
k. $\text{Pb}^{4+}, \text{OH}^-$	$\text{Pb}(\text{OH})_4$	lead (IV) hydroxide
l. $\text{Sn}^{2+}, \text{PO}_4^{3-}$	$\text{Sn}_3(\text{PO}_4)_2$	tin (II) phosphate
m. $\text{Na}^+, \text{CrO}_4^{2-}$	Na_2CrO_4	sodium chromate

10. Why are noble gases not likely to form a chemical bond?

11. How many valence electrons are in the following elements?

- | | |
|--------------|----------|
| a. Cesium | 1 |
| b. Rubidium | 1 |
| c. Gallium | 3 |
| d. Zinc | 2 |
| e. Strontium | 2 |

Covalent Compounds

12. How do covalent bonds form? (Note: You may use a reaction example as long as you explain it!)

13. Explain the differences between sigma and pi bonds. Why are there two different types of bonds?

Hint: different orbitals overlap and they occur in different regions between the two atoms. Be able to explain completely.

14. What is a Lewis structure? What are the advantages and disadvantages of Lewis structures?

15. Why do multiple bonds form?

16. Name the following covalent compounds.

- a. N_2O **dinitrogen oxide**
- b. PCl_3 **phosphorous trichloride**
- c. AlCl_3 **aluminum trichloride**
- d. SF_6 **sulfur hexafluoride**
- e. Cl_2O_7 **dichlorine heptoxide**

17. Write the formulas for the following compounds.

- a. carbon dioxide **CO_2**
- b. dinitrogen tetrahydride **N_2H_4**
- c. carbon tetrabromide **CBr_4**
- d. diphosphorous trioxide **P_2O_3**
- e. boron trichloride **BCl_3**

18. Draw Lewis structures and provide the molecular geometry for the following compounds.

- a. NF_3 **trigonal pyramidal**
- b. CS_2 **linear**
- c. ClO_4^- **tetrahedral**
- d. BF_4^- **tetrahedral**

Lewis structures are on the answer key in my room. I will try to get these drawn in with my pen tablet soon.

e. SO_2 **bent**

f. ClF_5 **square pyramidal**

19. What is the octet rule? What are some of the exceptions to the octet rule?

20. What are resonance structures?

More than one equally valid Lewis structure for a molecule.

21. What is the VSEPR model? Explain completely!

The Valence Shell Electron Pair Repulsion model. What does it tell you? How do molecules get their geometries?

22. What is bond angle?

Ionic and Covalent Compounds

23. Would you expect the following combinations of elements to form ionic or covalent compounds?

- | | |
|-------------|-----------------|
| a. Li and S | ionic |
| b. O and S | covalent |
| c. Al and O | ionic |
| d. F and Cl | covalent |
| e. I and K | ionic |
| f. H and N | covalent |

24. Complete the following table.

Type of Bond	Chemical Formula	Chemical Name
Ionic	K ₂ S	potassium sulfide
Ionic	Fe ₂ (CO ₃) ₃	iron (III) carbonate
Covalent	CCl ₄	carbon tetrachloride
Ionic	CaO	calcium oxide
Ionic	K ₃ P	potassium phosphide
Covalent	H ₂ S	dihydrogen sulfide
Covalent	NF ₃	nitrogen trifluoride
Ionic	Na ₃ PO ₄	sodium phosphate
Ionic	NH ₄ Cl	ammonium chloride
Covalent	P ₄ O ₁₀	tetraphosphorous decoxide
Ionic	PbS	lead (II) sulfide
Covalent	PCl ₅	phosphorous pentachloride
Covalent	SeF ₆	selenium hexafluoride
Ionic	Ca(OH) ₂	calcium hydroxide
Ionic	(NH ₄) ₂ SO ₄	ammonium sulfate
Ionic	MgBr ₂	magnesium bromide