

Name: _____

Homework was checked against the key with wrong answers corrected.

Parent Signature: _____

Chapter 15: Ionic Bonding and Ionic Compounds

Each numbered question is worth 0.5 point except as noted. Total possible = 28 points.

Watch the Tyler DeWitt video, *Ionic Bonding Introduction* (linked on our class website) at <https://www.youtube.com/watch?v=Qf07-8Jhhpc&t=8s>

1. What is a chemical bond?
2. What are the three types of chemical bonds?
 - a.
 - b.
 - c.
3. What kind of atoms are bonded together in ionic bonds?
4. What are examples of three ionic compounds as provided in the video?
 - a.
 - b.
 - c.

Consider the bonding interaction of NaCl (sodium chloride) and answer #5-8 below.

5. What is the driving force behind the bonding of a sodium atom with a chlorine atom, to ultimately form sodium chloride?
6. Which atom “gives” the electron? _____ What kind of charge does this atom have once it gives the electron away? _____ Which atom “accepts” the electron? _____ What kind of charge does this atom have once it accepts the electron? _____
7. Atoms that have a net electrical charge are called _____.
8. What are the three steps in the formation of sodium chloride? (1)
 - a.
 - b.
 - c.

Refer to Chapter 15 – Ionic Bonding and Ionic Compounds to answer #1-3 below.

1. What are valence electrons (p. 413)? (1)
2. What are electron dot structures (p. 414)? (1)

3. What is the octet rule (p. 414)?

Watch the Tyler DeWitt video, *Ionic Bonding Part 2* (linked on our class website) at <https://www.youtube.com/watch?v=5EwmedLuRmw&t=20s>

Don't be thrown off by the electron shell diagram he uses. It's simply another way to represent the electrons around atoms.

1. How many valence electrons does sodium have? _____
How many valence electrons does chlorine have? _____

2. Draw electron shell diagrams (like in the video) for both sodium and chlorine. (1)

Sodium atom	Chlorine atom

3. Why is atomic sodium not "happy" or unstable? Why is atomic chlorine unstable? (1)

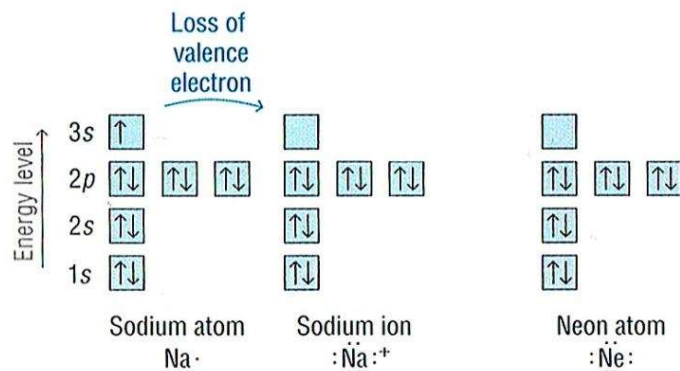
4. How do the two atoms resolve their instability issues? (1)

5. Draw electron shell diagrams for sodium ion and chloride. (1)

Sodium ion	Chloride

6. How many valence electrons does the chloride ion have? _____ How many valence electrons does the sodium ion have? _____

7. What are the net charges on sodium ion and chloride?

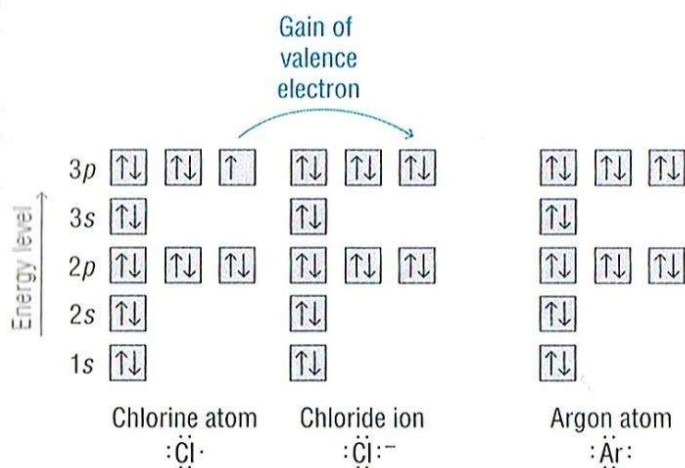


From text, pp. 415 – 417.

8. (1 point) Look at the orbital energy diagram for sodium (above). Sodium loses its valence electron (↑), from which orbital? _____

What do you notice about the electron configuration of sodium ion and neon?

Write out this configuration. _____



9. (1 point) Examine the orbital energy diagram for chlorine atom. Chlorine gains an electron (↓) in which orbital? _____

What do you notice about the electron configuration of chloride and argon?

Write out this configuration. _____

Watch the Tyler DeWitt video, *Ionic Bonding Part 3* at

<https://www.youtube.com/watch?v=RkZNYuSho0M>

1. What keeps the seven electrons in the valence shell of chlorine from filling the valence shell of sodium? Why does the single sodium electron move to chlorine instead? (1)

2. Electrons always move from the _____ to the _____.

3. In nature, do you frequently come across just two atoms joined in an ionic bond? What is the name of the three-dimensional structure that ions typically form? (1)

Section 15.2: Ionic Bonds

10. Explain why ionic compounds can conduct electricity when melted and when in aqueous solutions.

13. Which pairs of elements are likely to form ionic compounds?

- a. chlorine and bromine
- b. potassium and helium
- c. lithium and chlorine
- d. iodine and sodium

Section 15.3 Bonding in Metals

15. Use metallic bonding theory to explain the physical properties of metals. (1)

17. In your own words define metallic bond.

18. Describe what is meant by ductile and malleable.

Chapter Review

23. Write electron dot structures for each of the following elements. 15.1 (2)

- a. Cl
- b. S
- c. Al
- d. Li

25. How many electrons must each atom lose to attain a noble-gas electron configuration?

15.1 (1)

- a. Ca
- b. Al
- c. Li
- d. Ba

26. Write the formula for the ion formed when each of the following elements loses its valence electrons. 15.1 (1)

- a. aluminum
- b. lithium
- c. barium
- d. potassium

29. What is the formula of the ion formed when the following elements gain or lose valence electrons and attain noble-gas configurations? 15.1 (1)

- a. sulfur
- b. sodium
- c. fluorine
- d. phosphorus

32. Write electron configurations for the following and comment on the result. 15.1 (1)

a. N^{3-}

b. O^{2-}

c. F^-

d. Ne

40. Name the three crystal arrangements of closely packed metal atoms. Give an example of a metal that crystallizes in each arrangement. 15.3 (1)

41. Name at least two alloys that you have used or seen today. 15.3 (1)