

# 7 Ionic and Metallic Bonding

## 7.1 Ions

**Essential Understanding** Ions form when atoms gain or lose valence electrons, becoming electrically charged.

### Valence Electrons/Octet Rule

1. What are valence electrons?

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2. The valence electrons largely determine the \_\_\_\_\_ of an element and are usually the only electrons used in \_\_\_\_\_.

3. Is the following sentence true or false? The group number of a representative element in the periodic table is related to the number of valence electrons it has.

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4. What is the relationship between valence electrons and the period number? \_\_\_\_\_

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5. What is an electron dot structure?

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6. Draw the electron dot structure for each of the following atoms.

a. argon \_\_\_\_\_

c. iodine \_\_\_\_\_

b. calcium \_\_\_\_\_

d. silicon \_\_\_\_\_

7. What is the octet rule?

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8. Metallic atoms tend to \_\_\_\_\_ valence electrons to produce a positively charged ion. Most nonmetallic atoms achieve a complete octet by gaining or \_\_\_\_\_ electrons.

## Formation of Cations

8. What are cations and how are they formed?

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9. Write the electron configurations for these metals, and **circle** the electrons lost when each metal forms a cation.

a. Mg \_\_\_\_\_

b. Al \_\_\_\_\_

c. K \_\_\_\_\_

10. Which noble gas notation will the following elements have when they form ions (You can just list the noble gas name)?

a. Ca \_\_\_\_\_

b. Mg \_\_\_\_\_

c. Ra \_\_\_\_\_

## Formation of Anions

11. Atoms of most nonmetallic elements achieve noble-gas electron configurations by gaining electrons to become \_\_\_\_\_, or negatively charged ions.

12. What is unique about the name of an anion of a nonmetallic element?

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13. What property of nonmetallic elements makes them more likely to gain electrons than lose electrons?

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14. Is the following sentence true or false? Elements of the halogen family lose one electron to become halide ions. \_\_\_\_\_

15. How many electrons will each element gain in forming an ion?

a. nitrogen \_\_\_\_\_

c. sulfur \_\_\_\_\_

b. oxygen \_\_\_\_\_

d. bromine \_\_\_\_\_

16. Write the ion symbol and electron configuration for each ion from Question 16, and name the noble gas with the same configuration.

a. nitride \_\_\_\_\_

b. oxide \_\_\_\_\_

c. sulfide \_\_\_\_\_

d. bromide \_\_\_\_\_

17. Determine if the following groups generally form anions (A) or cations (C) or neither (N).

a. Group 2A \_\_\_\_\_

c. Group 6A \_\_\_\_\_

e. Group 1A \_\_\_\_\_

b. Group 8A \_\_\_\_\_

d. Group 7A \_\_\_\_\_

f. Group 5A \_\_\_\_\_

