

## Ions & Their Charges Worksheet

Name \_\_\_\_\_ Date \_\_\_\_\_ Teacher \_\_\_\_\_

Diagram of charges based on groups on the periodic table including transition metals and noble gases:

IA	IIA	Transition metals	IIIA	IVA	VA	VIA	VIIA	VIII
+1	+2	+2	+3	+4 or -4	-3	-2	-1	0

Diagram of charges based on groups on the periodic table without transition metals, "d" block, and without noble gases, group VIIIA, to illustrate symmetry of the charges:

IA	IIA	IIIA	IVA	VA	VIA	VIIA
+1	+2	+3	+4, -4	-3	-2	-1

The charge on an ion will involve a number and a sign. The number will always be the number of electrons involved, e.g., loss of two electrons is +2. The sign will be positive if electrons, negatives, are lost and negative if electrons, negatives, are gained.

I. Determine the charges on the following using the diagram above as a guide:

1. An atom having lost two electrons \_\_\_\_\_
2. An atom having lost six electrons \_\_\_\_\_
3. An atom having gained one electron \_\_\_\_\_
4. An atom having gained three electrons \_\_\_\_\_
5. An atom having lost five electrons \_\_\_\_\_
6. An atom having gained two electrons \_\_\_\_\_
7. An atom having lost one electron \_\_\_\_\_
8. An atom having gained four electrons \_\_\_\_\_

II. Determine the charges on the following elements based on their locations on the periodic table using the knowledge gained during the Are You Charged? lesson:

1. Fluorine, F #7 \_\_\_\_\_
2. Magnesium, Mg #12 \_\_\_\_\_
3. Aluminum, Al #13 \_\_\_\_\_
4. Sodium, Na #11 \_\_\_\_\_
5. Nitrogen, N #7 \_\_\_\_\_
6. Zinc, Zn #30 \_\_\_\_\_
7. Hydrogen, H #1 \_\_\_\_\_
8. Argon, Ar #18 \_\_\_\_\_
9. Barium, Ba #56 \_\_\_\_\_
10. Sulfur, S #16 \_\_\_\_\_

III. Answer the following questions based on knowledge gained from the Are You Charged? lesson:

1. Will metals lose or gain electrons?

Answer \_\_\_\_\_

2. Considering your answer for #1, what type of ion will metals form, positive or negative?

Answer \_\_\_\_\_

3. What is the name of a positive ion?

Answer \_\_\_\_\_

4. What is the name of a negative ion?

Answer \_\_\_\_\_

5. How many electrons are contained in a completed outer shell for period 1?

Answer \_\_\_\_\_

6. How many electrons are contained in completed outer shells for all periods above period 1?

Answer \_\_\_\_\_

7. What is the charge on ions that is common to all elements of the "d" block, transition metals?

Answer \_\_\_\_\_

8. What is the charge on ions that is common to all elements of the "f" block, inner-transition metals?

Answer \_\_\_\_\_

9. What types of electrons, "s," "p," "d," or "f," are considered those involved in the make-up of the outer shells of atoms?

Answer \_\_\_\_\_

10. What is the term used for a completed outer shell of eight electrons?

Answer \_\_\_\_\_

11. What is the only charge common to group IA elements?

Answer \_\_\_\_\_

12. What is the only charge common to group IIA elements?

Answer \_\_\_\_\_

13. What type of electrons, "s," "p," "d," or "f," are involved in ion formation of group IA and group IIA elements?

Answer \_\_\_\_\_

14. What does carbon, C #6, group IVA, form either +4 or -4 ions?

Answer \_\_\_\_\_

15. Why do elements in group VIIIA, noble gases, have zero, 0, as the charge that their ions will form?

Answer \_\_\_\_\_

## ***Charges of Ions – Test***

Name \_\_\_\_\_ Period \_\_\_\_\_ Teacher \_\_\_\_\_

***I. Answer the following by placing the letter of the answer that best completes the statement or answers the question.***

- \_\_\_\_\_ 1. What is the most likely combination of types of electrons that are involved in forming complete outer shells? a.) “s” and “p”  
b.) “s” and “d” c.) “p” and “d” d.) “p” and “f.”
- \_\_\_\_\_ 2. The ion charge that is common to all transition elements is  
a.) +1 b.) +2 c.) -1 d.) -2.
- \_\_\_\_\_ 3. Metals form which type of ions? a.) negative b.) anions  
c.) cations d.) neutral.
- \_\_\_\_\_ 4. What is the most probable charge of the ions of elements located in group IIIA? a.) +1 b.) +2 c.) +3 d.) +4.
- \_\_\_\_\_ 5. What is the charge of an atom that has lost four electrons?  
a.) positive b.) +4 c.) negative d.) -4.

***II. Answer the following placing your answers on the spaces provided at right:***

1. What is the charge on an atom that has gained one electron? 1. \_\_\_\_\_
2. What is the charge of an atom that has lost three electrons? 2. \_\_\_\_\_
3. What is the charge of elements in group VIA? 3. \_\_\_\_\_
4. What is the charge of elements in group IA? 4. \_\_\_\_\_
5. What is the most probable charge of an ion of fluorine, #9, group VIIA?  
5. \_\_\_\_\_

6. What is the most probable charge of an ion of magnesium, #12, group IIA?

6. \_\_\_\_\_

7. What is the most probable charge of an ion of sulfur, #16, group VIA?

7. \_\_\_\_\_

8. What are the two charges possible for elements in group IVA?

8. \_\_\_\_\_

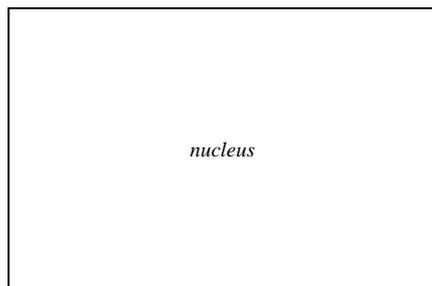
9. What is the charge common to all inner-transition elements, the “f” block?

9. \_\_\_\_\_

10. Which electrons, “s,” “p,” “d,” or “f,” are involved in the ion formation of  $Al^{+3}$ ?

10. \_\_\_\_\_

**III. Draw an illustration similar to the one used in the Are You Charged? lesson, of the way phosphorus would form a  $-3$  ion showing the nucleus charges of protons and the electron cloud charges of electrons.**



**IV. Fill in the table with the correct charges of the groups listed:**

Group IA	Group IIA	Group IIIA	Group IVA	Group VA	Group VIA	Group VIIA

## Ions & Their Charges Worksheet Answer Key

I. Determine the charges on the following using the diagram above as a guide:

1. An atom having lost two electrons +2
2. An atom having lost six electrons +6
3. An atom having gained one electron -1
4. An atom having gained three electrons -3
5. An atom having lost five electrons +5
6. An atom having gained two electrons -2
7. An atom having lost one electron +1
8. An atom having gained four electrons -4

II. Determine the charges on the following elements based on their locations on the periodic table using the knowledge gained during the Are You Charged? lesson:

1. Fluorine, F #7 -1
2. Magnesium, Mg #12 +2
3. Aluminum, Al #13 +3
4. Sodium, Na #11 +1
5. Nitrogen, N #7 -3
6. Zinc, Zn #30 +2
7. Hydrogen, H #1 +1
8. Argon, Ar #18 0
9. Barium, Ba #56 +2
10. Sulfur, S #16 -2

III. Answer the following questions based on knowledge gained from the Are You Charged? lesson:

1. Will metals lose or gain electrons?  
Answer lose
2. Considering your answer for #1, what type of ion will metals form, positive or negative?  
Answer positive
3. What is the name of a positive ion?  
Answer cation
4. What is the name of a negative ion?  
Answer anion
5. How many electrons are contained in a completed outer shell for period 1?  
Answer two
6. How many electrons are contained in completed outer shells for all periods above period 1?  
Answer eight
7. What is the charge on ions that is common to all elements of the "d" block, transition metals?  
Answer +2

8. What is the charge on ions that is common to all elements of the “f” block, inner-transition metals?  
 Answer           +3
9. What types of electrons, “s,” “p,” “d,” or “f,” are considered those involved in the make-up of the outer shells of atoms?  
 Answer           “s” & “p”
10. What is the term used for a completed outer shell of eight electrons?  
 Answer           perfect octet
11. What is the only charge common to group IA elements?  
 Answer           +1
12. What is the only charge common to group IIA elements?  
 Answer           +2
13. What type of electrons, “s,” “p,” “d,” or “f,” are involved in ion formation of group IA and group IIA elements?  
 Answer           “s”
14. What does carbon, C #6, group IVA, form either +4 or -4 ions?  
 Answer           both
15. Why do elements in group VIIIA, noble gases, have zero, 0, as the charge that their ions will form?  
 Answer           filled outer shells
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### ***Charges of Ions-Test Answer Key***

- a   1. What is the most likely combination of types of electrons that are involved in forming complete outer shells? a.) “s” and “p”  
 b.) “s” and “d” c.) “p” and “d” d.) “p” and “f.”
- b   2. The ion charge that is common to all transition elements is  
 a.) +1 b.) +2 c.) -1 d.) -2.
- c   3. Metals form which type of ions? a.) negative b.) anions  
 c.) cations d.) neutral.
- c   4. What is the most probable charge of the ions of elements located in group IIIA? a.) +1 b.) +2 c.) +3 d.) +4.
- b   5. What is the charge of an atom that has lost four electrons?  
 a.) positive b.) +4 c.) negative d.) -4.

1. What is the charge on an atom that has gained one electron? 1. -1
2. What is the charge of an atom that has lost three electrons? 2. +3
3. What is the charge of elements in group VIA? 3. -2
4. What is the charge of elements in group IA? 4. +1
5. What is the most probable charge of an ion of fluorine, #9, group VIIA? 5. -1
6. What is the most probable charge of an ion of magnesium, #12, group IIA? 6. +2
7. What is the most probable charge of an ion of sulfur, #16, group VIA? 7. -2
8. What are the two charges possible for elements in group IVA? 8. +4, -4
9. What is the charge common to all inner-transition elements, the "f" block? 9. +3
10. Which electrons, "s," "p," "d," or "f," are involved in the ion formation of  $Al^{+3}$ ? 10. 2 "s," 1 "p"

Group IA	Group IIA	Group IIIA	Group IVA	Group VA	Group VIA	Group VIIA
+1	+2	+3	+4,-4	-3	-2	-1