

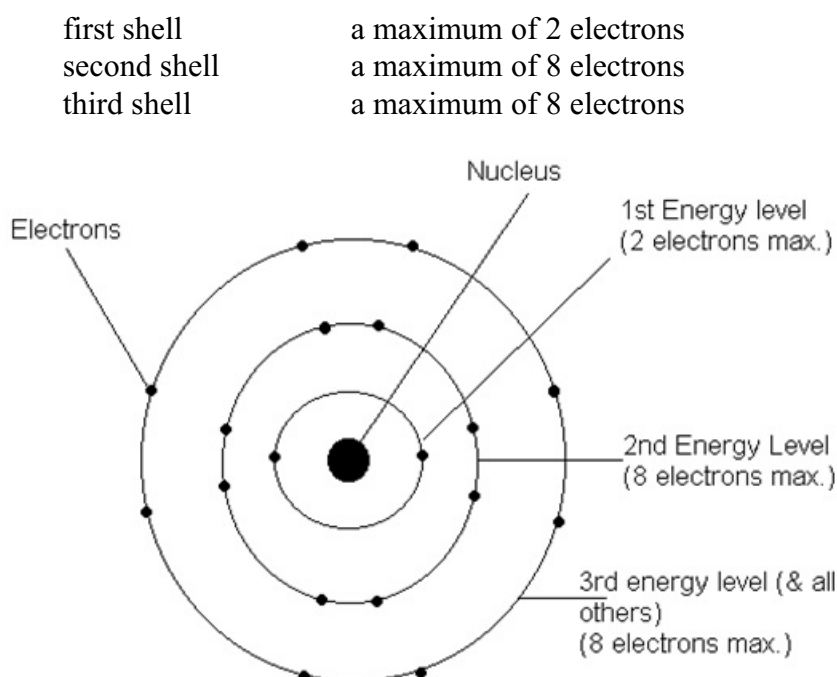
Science 1206
Unit 2: Chemical Reactions
Worksheet 5: What Is An Ions



You have learned that atoms are composed of protons, neutrons, and electrons. The electrons occupy energy levels that surround the nucleus. Niels Bohr created a visual model of the atom to make them easy to understand. You will only have to draw Bohr Model's for the first 18 elements on the periodic table.

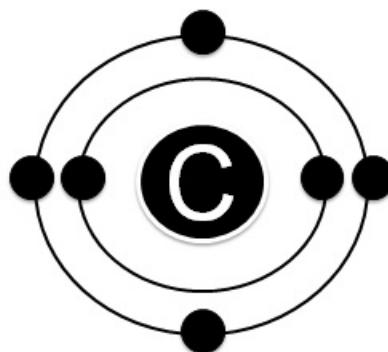
How to Draw a Bohr Model:

- 1) Find your element on the periodic table.
- 2) Determine the number of electrons – it is the same as the atomic number. This is how many electrons you will draw
- 3) Draw a nucleus with the element symbol inside
- 4) Draw the shells around the nucleus. Remember that electrons are arranged in Energy Levels or Shells around the nucleus of an atom and are filled in the following order:



- 5) Check your work. Only two electrons can fit in the 1st shell. The 2nd shell can hold up to 8 electrons. The 3rd shell can hold **18**, but the elements in the first few periods only use 8 electrons.

Example: Bohr Model for Carbon:



Terminology:

Valence shell : The shell containing electrons that is furthest from the nucleus.

Valence electrons: The electrons in the outer most electron shell. For example, carbon has 4 valance electrons in its outer shell.

ION – refers to an atom that loses or gains electrons.

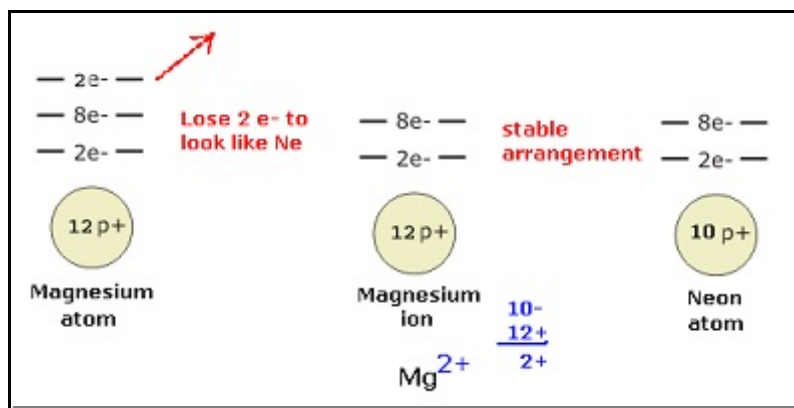


Electrons are lost or gained so that the valance shell is filled. The valance shell is filled to make the atom more stable like the noble gases

There are two types of ions:

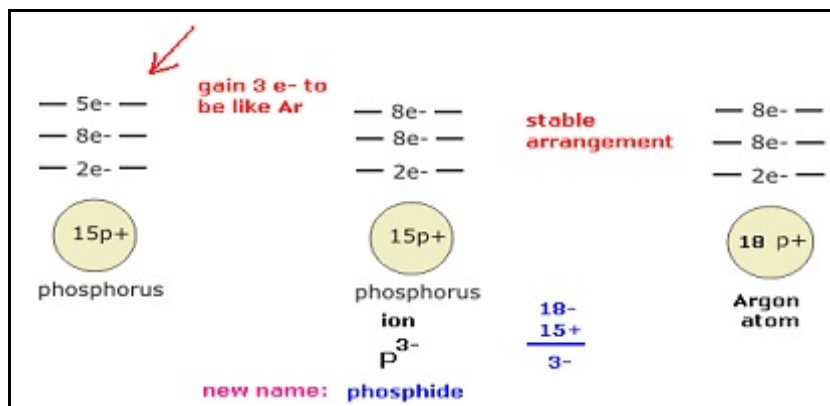
1) Cation

- Metal atoms that lose electrons to become positive. (clue: the t in cation resembles a + sign).



2) Anion

- Non-metal atoms that gains electrons to become more negative. An anion is A Negative ION (A N ion)



PART A: MULTIPLE CHOICE

1. What is the key idea of the Bohr model?

- (A) Explained that there was a nucleus
- (B) Explained that atoms are hard to see with the naked eye
- (C) That an atom was like a raisin bean bun
- ✓ (D) There are electrons inside the atom that orbit the nucleus

2. What is the maximum number of electrons allowed in the 1st, 2nd and 3rd shell in a Bohr diagram?

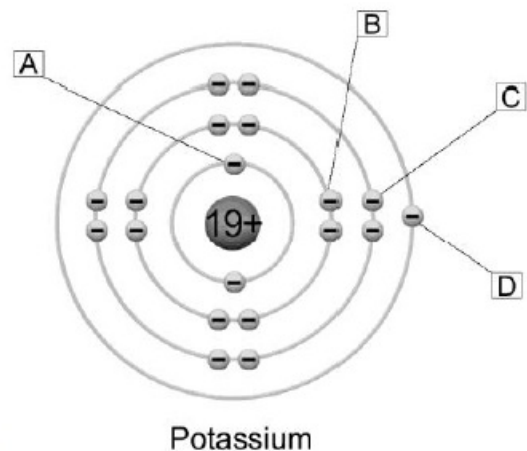
- (A) 1st: 2 2nd: 4 3rd: 4
- (B) 1st: 2 2nd: 5 3rd: 7
- (C) 1st: 3 2nd: 9 3rd: 9
- ✓ (D) 1st: 2 2nd: 8 3rd: 8

3. Complete the following sentence with one of the options given: “The valence electrons are those electrons situated _____ of the atom”.

- (A) on the first energy level
- (B) on the second energy level
- (C) on the third energy level
- ✓ (D) on the last energy level

4. In the atomic model of potassium below, which letter represents a valence electron?

- (A)
- (B)
- ✓ (C)
- (D)



5. Consider the atomic numbers below. Which atomic number represents an atom with 3 valence electrons?

- ✓ (A) 3
- (B) 5
- (C) 8
- (D) 16

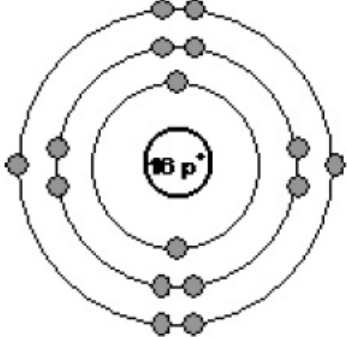
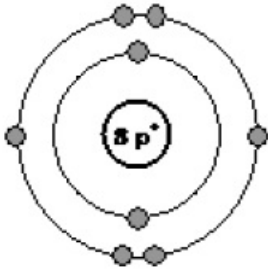
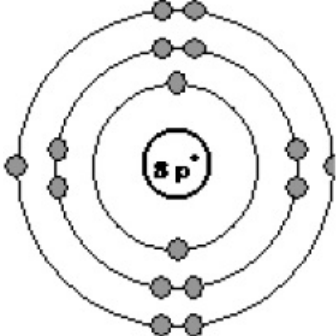
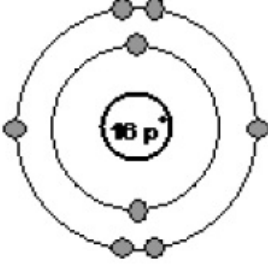
6. Which of the following would be the electron configuration for a fluorine atom?

- ✓ (A) 2-6
- (B) 2-7
- (C) 2-6-1
- (C) 2-5-2

7. Neon has 10 protons and 10 electrons. The electrons fill the energy levels in Neon like this:

- (A) 2 in the first, 2 in the second, and 6 in the third
- (B) 4 in the first, 4 in the second, and 2 in the third
- (C) 2 in the first, 4 in the second, and 4 in the third
- ✓ (D) 2 in the first, and 8 in the second

8. Which of the illustrations below best represents a Bohr diagram of an oxygen atom?

<p>(A)</p> 	<p>(B)</p> 
<p>(C)</p> 	<p>(D)</p> 

9. What do the elements situated on the same period have in common?

- (A) The same number of valence electrons
- (B) The same chemical reactivity
- ✓ (C) The same number of electron shells
- (D) The same number of electrons

10. What do the elements situated in the same group have in common?

- ✓ (A) The same number of valence electrons
- (B) The same number of protons
- (C) The same number of electron shells
- (D) The same number of electrons

11. Elements situated in the same group display similar chemical properties because:

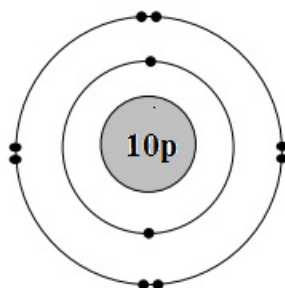
- (A) They have similar sizes
- (B) They have the same number of electron shells
- ✓ (C) They have the same number of valence electrons
- (D) They belong to the same period

12. An atom of an element belonging to the noble gas family has

- (A) One outer shell electron.
- (B) Two outer shell electrons.
- (C) All outer shell electrons but one.
- ✓ (D) All outer shell electrons.

13. An atom of an element belonging to the alkali metal family has
- (A) One outer shell electron.
 - (B) Two outer shell electrons.
 - (C) All outer shell electrons but one.
 - (D) All outer shell electrons.
14. An atom of an element belonging to the halogen family has
- (A) One outer shell electron.
 - (B) Two outer shell electrons.
 - (C) All outer shell electrons but one.
 - (D) All outer shell electrons.

Use the Bohr Model shown below to answer questions 15 to 20:



15. Which atom does this represent?
- ✓ (A) Argon
 - (B) Lithium
 - (C) neon
 - (D) sodium
16. How many energy shells does this atom have?
- ✓ (A) 1
 - (B) 2
 - (C) 3
 - (D) 4
17. What **period** on the periodic table would this atom be found?
- ✓ (A) 1
 - (B) 2
 - (C) 3
 - (D) 4
18. How many valence electrons shown ?
- ✓ (A) 10
 - (B) 8
 - (C) 6
 - (D) 2
19. What group number does this element belong to?
- (A) 6
 - (B) 8
 - (C) 16
 - ✓ (D) 18

20. What **group A** does this atom belong to?
- (A) 6
 - ✓ (B) 8
 - (C) 16
 - (D) 18
21. Why are ions formed?
- (A) To make the atom explode
 - (B) To ensure that the valance shell is not filled
 - ✓ (C) To make the atom more stable like a noble gas
 - (D) To keep the number of protons equal to the number of electrons
22. An atom that gains an electron
- (A) Becomes a cation.
 - (B) Becomes a different isotope of the same element.
 - (C) Has a different atomic number.
 - ✓ (D) Becomes an anion.
23. An atom that loses an electron
- ✓ (A) Becomes a cation.
 - (B) Becomes a different isotope of the same element.
 - (C) Has a different atomic number.
 - (D) Becomes an anion.
24. Metals tend to _____ electrons and nonmetals tend to _____ electrons.
- (A) Gain, gain
 - ✓ (B) Lose, lose
 - (C) Lose, gain
 - (D) Gain, gain
25. Anions tend to be _____ and cations tend to be _____.
- (A) Metals, metals
 - (B) Nonmetals, nonmetals
 - ✓ (C) Metals, nonmetals
 - (D) Nonmetals, metals
26. Anions tend to have a _____ charge and cations tend to have a _____ charge.
- (A) Positive, positive
 - (B) Negative, negative
 - (C) Positive, negative
 - ✓ (D) Negative, positive
27. Ions in the same group like to have _____ charge.
- ✓ (A) The same
 - (B) A different
 - (C) A neutral
 - (D) No

28. A calcium ion (Ca^{2+}) has
- (A) lost two electrons.
 - (B) gained two electrons.
 - (C) gained two protons.
 - (D) lost two protons.
29. An atom becomes an ion with a charge of 2^+ when it:
- (A) Gains 2 electrons
 - (B) Loses 2 electrons
 - (C) Gains 2 protons
 - (D) Loses 2 protons
30. Typically form ions with a 2^+ charge.
- (A) Alkaline earth metals
 - (B) Halogens
 - (C) Chalcogens
 - (D) Alkali metals
31. Sodium forms an ion with a charge of _____.
- (A) 1^+
 - (B) 1^-
 - (C) 2^+
 - (D) 2^-
32. Aluminum forms an ion with a charge of _____.
- (A) 2^+
 - (B) 1^-
 - (C) 3^+
 - (D) 2^-
33. Calcium forms an ion with a charge of _____.
- (A) 1^-
 - (B) 2^-
 - (C) 1^+
 - (D) 2^+
34. Fluorine forms an ion with a charge of _____.
- (A) 1^-
 - (B) 1^+
 - (C) 2^-
 - (D) 2^+
35. Iodine forms an ion with a charge of _____.
- (A) 1^-
 - (B) 1^+
 - (C) 2^-
 - (D) 2^+

36. Oxygen forms an ion with a charge of _____.

- ✓ (A) 2^-
- (B) 2^+
- (C) 3^-
- (D) 3^+

37. What type of ions have names ending in -ide?

- (A) Only metal ions
- (B) Only cations
- (C) Only gaseous ions
- ✓ (D) Only anions

38. How many electrons does the Al^{3+} ion possess?

- (A) 16
- ✓ (B) 10
- (C) 6
- (D) 13

39. How many valence electrons are in a sodium ion?

- (A) 0
- (B) 1
- (C) 2
- ✓ (D) 8

Part B: Written Response

1. Complete the table below:

Element	Symbol and Charge	Metal or Nonmetal	Anion and Cation
Calcium	Ca^{2+}	Metal	Cation
Bromine	Br^{1-}	Nonmetal	Anion
Cesium			
Oxygen			
Magnesium			

2. Complete the chart below:

Ion name	Ion Symbol	# of Protons	# of Electrons	# of electrons lost or gained	Same number of electrons as which Noble Gas
fluoride	F^{1-}	9	10	gained one	neon
		53	54		
		16		gained two	
potassium				lost 1	
	Ca^{2+}				
aluminium			10		
	H^{1-}				